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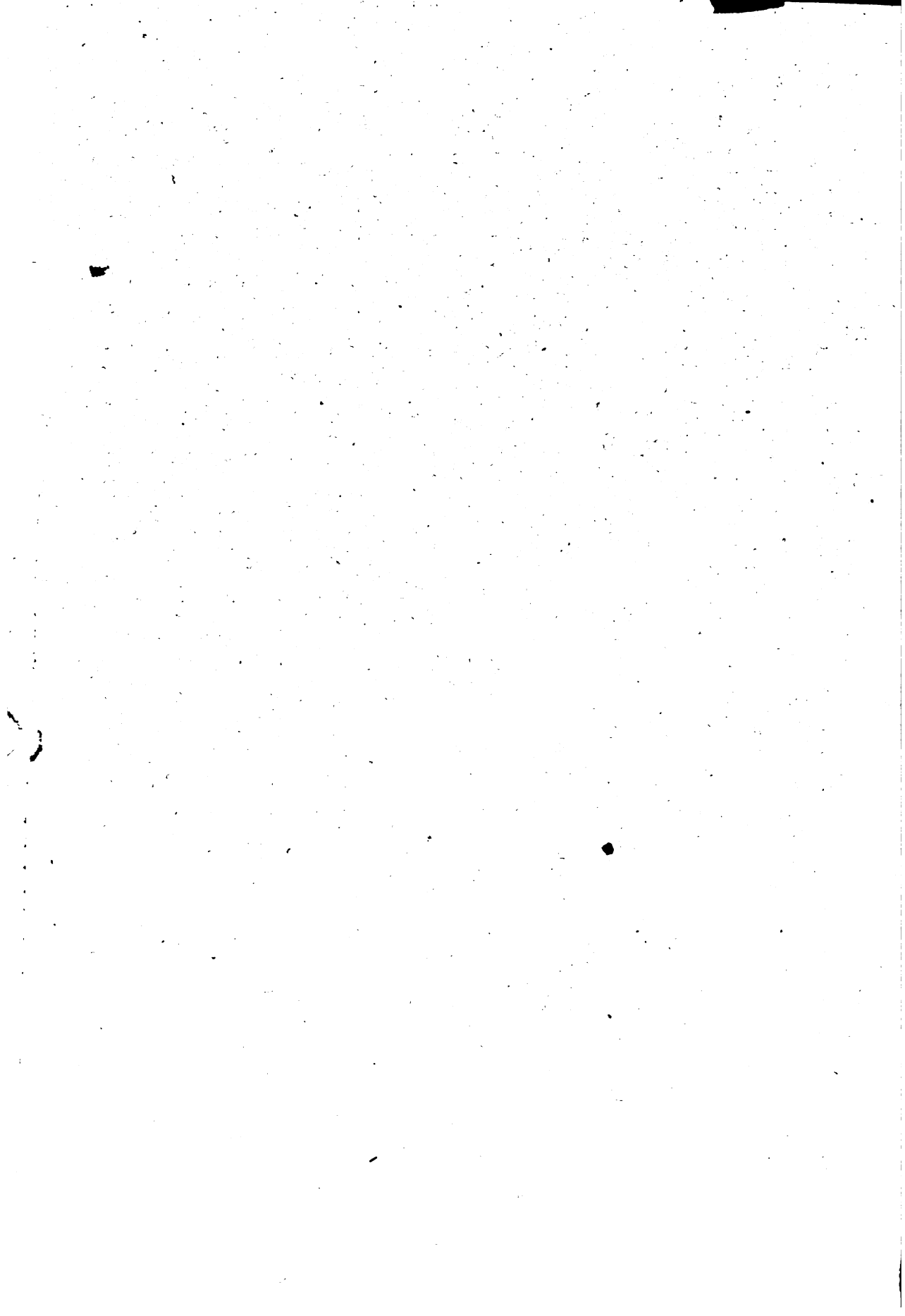
Nautical almanac

1898

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THE  
PACIFIC COASTER'S  
NAUTICAL ALMANAC

FOR THE YEAR

1898

*FIRST EDITION*

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PUBLISHED BY AUTHORITY OF THE SECRETARY OF THE NAVY

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1897

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FOR THE YEAR

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# CONTENTS.

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Notices respecting Government publications for the use of Navigators.....	Page 3
Notice to Mariners .....	4
Ephemeris of the Sun for Greenwich Apparent Noon.....	6-29
Mean Places of one hundred and fifty Fixed Stars for the beginning of 1898 .....	30-32
Latitude by observed Altitude of Polaris.....	33
Reduction of Mean Solar into Sideral Time .....	34, 35
Explanation of the Ephemeris of the Sun .....	36
Latitude by Meridian Altitude of the Sun .....	37
Longitude by Chronometer.....	37, 38
Tide tables .....	39-63
Tidal Constants.....	64-74
Sunrise and Sunset Tables for San Francisco, Cal.....	75-77

## NOTICE RESPECTING GOVERNMENT PUBLICATIONS FOR THE USE OF NAVIGATORS.

The original publications of the various Government Bureaus, from which the Coaster's Almanac has been compiled, may be obtained from the leading dealers in Nautical publications in the principal cities of the United States, generally at prices not exceeding the estimated cost of printing and paper.

The following is a list of these and of kindred Nautical publications:

### PUBLICATIONS OF THE NAUTICAL ALMANAC OFFICE.

The American Ephemeris and Nautical Almanac;  
The American Nautical Almanac;  
The Pacific Coaster's Nautical Almanac.

### PUBLICATIONS OF THE HYDROGRAPHIC OFFICE.

These comprise—

The American Practical Navigator;  
Pilot Charts of the North Atlantic and North Pacific;  
Notices to Mariners; Weekly Bulletins;  
Foreign Light List;  
Sailing Directions;  
Charts of Foreign Coasts, etc.

Detailed notices and suggestions respecting these publications are given in the notice to mariners on the next page.

### PUBLICATIONS OF THE UNITED STATES LIGHT-HOUSE BOARD.

A detailed official list of light-houses may be obtained free of charge by any shipmaster by addressing a request to that effect to the Light-House Board, Treasury Department, Washington, D. C.

### PUBLICATIONS OF THE UNITED STATES COAST AND GEODETIC SURVEY.

The charts, tide tables, and other publications of the Coast Survey may generally be obtained from the same dealers who supply the publications of the Navy Department.

## NOTICE TO MARINERS.

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For the purpose of gathering and disseminating information upon subjects connected with navigation, Branch Hydrographic Offices have been established in the following cities:

Boston, in the Custom-house; New York, Maritime Exchange; Philadelphia, Maritime Exchange; Baltimore, Custom-house; Norfolk, Custom-house; Savannah, Custom-house; New Orleans, Maritime Association; Chicago, Masonic Temple; San Francisco, Merchants' Exchange; Portland (Oregon), Chamber of Commerce; Port Townsend, Custom-house.

These offices are being supplied with all publications of the Hydrographic Office and Coast Survey, and those of the British Admiralty of ground not covered by the publications of the two U. S. Offices; and any information which may be derived from these or other sources is at the disposal of the maritime community, or others interested in maritime affairs, free of charge.

Copies of the following publications are furnished upon application: Weekly Notice to Mariners, U. S. Beacon and Buoy List, U. S. Light List. Copies of the North Pacific Pilot Chart and the weekly Hydrographic Bulletin are supplied to all cooperating with this Office in obtaining the information covered by them. Standard barometers and thermometers, with which the ship's instruments may be compared, are kept at each Branch Office.

Copies of the Pilot Chart, and all Notices to Mariners, will also be found in the offices of the United States consuls in all parts of the world. To assist in the preparation of the Pilot Chart, masters of vessels are requested to send to the branch offices of the port where they arrive a notice giving the limits of the trade winds, the position of all wrecks, floating spars, icebergs, waterspouts, and any danger which they may have encountered.

Masters of vessels making extended voyages are asked to keep the log books prepared by the Hydrographic Office.

Those who will keep these logs will be supplied gratuitously with general sailing charts for their voyage. These logs may be obtained from the branch offices or by application to the Hydrographic Office in Washington.

Abstract journals to enter storm data, and other blanks, can also be obtained.

All persons connected with navigation are earnestly requested to join with the Hydrographic Office in endeavoring to extend the scope and usefulness of this work and render it as valuable as possible to the maritime interests.

THE PACIFIC COASTER'S  
NAUTICAL ALMANAC.

## AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S					Sideral Time of Semi-diameter Passing Meridian.	Equation of Time, to be Added to Apparent Time.	Diff. for 1 Hour.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semi-diameter.			
Sat. SUN. Mon.	1	<sup>h</sup> 18 <sup>m</sup> 48 <sup>s</sup> 33.88	11.037	<sup>°</sup> 22 <sup>'</sup> 59 <sup>"</sup> 1.6	+12.81	<sup>'</sup> 16 <sup>"</sup> 18.37	<sup>s</sup> 71.04	<sup>m</sup> 3 <sup>s</sup> 55.32	<sup>s</sup> 1.177
	2	18 52 58.55	11.021	22 53 40.7	13.94	16 18.37	70.98	4 23.36	1.160
	3	18 57 22.85	11.004	22 47 52.4	15.07	16 18.37	70.92	4 51.02	1.143
Tues.	4	19 1 46.73	10.986	22 41 37.1	+16.20	16 18.36	70.86	5 18.26	1.126
Wed.	5	19 6 10.18	10.967	22 34 54.8	17.32	16 18.35	70.81	5 45.08	1.108
Thur.	6	19 10 33.16	10.947	22 27 45.7	18.43	16 18.33	70.75	6 11.42	1.088
Frid.	7	19 14 55.65	10.927	22 20 10.2	+19.53	16 18.30	70.69	6 37.29	1.067
Sat.	8	19 19 17.63	10.905	22 12 8.3	20.62	16 18.26	70.63	7 2.64	1.045
SUN.	9	19 23 39.08	10.882	22 3 40.3	21.71	16 18.22	70.56	7 27.47	1.023
Mon.	10	19 27 59.98	10.859	21 54 46.4	+22.78	16 18.18	70.48	7 51.74	1.000
Tues.	11	19 32 20.31	10.835	21 45 26.9	23.84	16 18.13	70.40	8 15.46	0.975
Wed.	12	19 36 40.05	10.810	21 35 42.0	24.89	16 18.07	70.32	8 38.57	0.950
Thur.	13	19 40 59.18	10.784	21 25 32.0	+25.93	16 18.00	70.23	9 1.08	0.925
Frid.	14	19 45 17.69	10.757	21 14 57.1	26.96	16 17.93	70.14	9 22.96	0.899
Sat.	15	19 49 35.54	10.730	21 3 57.7	27.98	16 17.86	70.05	9 44.21	0.871
SUN.	16	19 53 52.73	10.702	20 52 34.1	+28.98	16 17.78	69.96	10 4.79	0.842
Mon.	17	19 58 9.25	10.673	20 40 46.5	29.97	16 17.70	69.86	10 24.69	0.814
Tues.	18	20 2 25.06	10.643	20 28 35.3	30.95	16 17.61	69.76	10 43.89	0.785
Wed.	19	20 6 40.15	10.613	20 16 0.9	+31.91	16 17.52	69.66	11 2.38	0.755
Thur.	20	20 10 54.50	10.582	20 3 3.6	32.86	16 17.42	69.56	11 20.12	0.724
Frid.	21	20 15 8.11	10.551	19 49 43.7	33.79	16 17.32	69.46	11 37.11	0.693
Sat.	22	20 19 20.94	10.519	19 36 1.6	+34.71	16 17.22	69.35	11 53.36	0.661
SUN.	23	20 23 33.00	10.486	19 21 57.8	35.61	16 17.11	69.24	12 8.82	0.628
Mon.	24	20 27 44.25	10.452	19 7 32.6	36.49	16 17.00	69.13	12 23.47	0.595
Tues.	25	20 31 54.71	10.418	18 52 46.4	+37.35	16 16.89	69.02	12 37.34	0.561
Wed.	26	20 36 4.34	10.384	18 37 39.6	38.20	16 16.77	68.91	12 50.37	0.526
Thur.	27	20 40 13.15	10.350	18 22 12.6	39.04	16 16.65	68.80	13 2.59	0.492
Frid.	28	20 44 21.12	10.315	18 6 25.8	+39.85	16 16.53	68.68	13 13.97	0.457
Sat.	29	20 48 28.26	10.280	17 50 19.7	40.65	16 16.40	68.57	13 24.53	0.422
SUN.	30	20 52 34.55	10.245	17 33 54.6	41.43	16 16.27	68.46	13 34.23	0.387
Mon.	31	20 56 40.00	10.209	17 17 10.9	42.20	16 16.13	68.35	13 43.10	0.352
Tues.	32	21 0 44.60	10.174	S. 17 0 9.0	+42.95	16 15.99	68.23	13 51.12	0.318

NOTE.—The mean time of semidiameter passing may be found by subtracting 0.9 from the sideral time.

The sign + prefixed to the hourly change of declination indicates that south declinations are decreasing.

## PHASES OF THE MOON.

Pacific Standard Time.

○ Full Moon . . . Jan. 7 4 24.3 P. M.  
 ( Last Quarter . . . 15 7 44.5 A. M.  
 ● New Moon . . . 21 11 24.7 P. M.  
 ) First Quarter . . . 29 6 32.7 A. M.

( Apogee . . . . . Jan. 4 8.3 A. M.  
 ( Perigee . . . . . 20 4.5 A. M.

Day of the Month.	Sidereal Time at Greenwich Mean Noon.	Chronometer Rate. G., if gaining. L., if losing.	Chronometer Error. F., if fast. S., if slow.	Noon Position.	
				Latitude.	Longitude.
1	h m s 18 44 37.92				
2	18 48 34.48				
3	18 52 31.04				
4	18 56 27.60				
5	19 0 24.15				
6	19 4 20.71				
7	19 8 17.27				
8	19 12 13.83				
9	19 16 10.39				
10	19 20 6.95				
11	19 24 3.50				
12	19 28 0.06				
13	19 31 56.62				
14	19 35 53.18				
15	19 39 49.73				
16	19 43 46.29				
17	19 47 42.85				
18	19 51 39.40				
19	19 55 35.96				
20	19 59 32.52				
21	20 3 29.08				
22	20 7 25.63				
23	20 11 22.19				
24	20 15 18.75				
25	20 19 15.30				
26	20 23 11.86				
27	20 27 8.42				
28	20 31 4.97				
29	20 35 1.53				
30	20 38 58.09				
31	20 42 54.64				
32	20 46 51.20				

Diff. for 1 Hour,  
 +9.8565.  
 (Table II.)

NOTE.—The chronometer error and rate should be entered opposite the date of their determination in port, whether by observation, time-ball, or comparison. The same rate, with the accumulated or diminished error, should be entered on every successive day until a new rate and new error have been ascertained.

## AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S						Sidereal Time of Semi-diameter Passing Meridian.	Equation of Time, to be Added to Apparent Time.	Diff. for 1 Hour.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semi-diameter.				
		h m s	s	° ' "	"	' "	°	m s	s	
Tues.	1	21 0 44.60	10.174	S. 17 0 9.0	+42.95	16 15.99	68.23	13 51.12	0.318	
Wed.	2	21 4 48.37	10.140	16 42 49.4	43.67	16 15.84	68.12	13 58.31	0.283	
Thur.	3	21 8 51.30	10.105	16 25 12.4	44.39	16 15.69	68.00	14 4.68	0.248	
Frid.	4	21 12 53.40	10.070	16 7 18.4	+45.10	16 15.54	67.88	14 10.20	0.214	
Sat.	5	21 16 54.68	10.036	15 49 7.9	45.78	16 15.38	67.77	14 14.92	0.180	
SUN.	6	21 20 55.14	10.002	15 30 41.1	46.45	16 15.21	67.65	14 18.82	0.146	
Mon.	7	21 24 54.80	9.969	15 11 58.5	+47.10	16 15.04	67.54	14 21.91	0.112	
Tues.	8	21 28 53.66	9.936	14 53 0.5	47.73	16 14.86	67.43	14 24.21	0.079	
Wed.	9	21 32 51.74	9.904	14 33 47.4	48.34	16 14.67	67.32	14 25.73	0.047	
Thur.	10	21 36 49.05	9.872	14 14 19.7	+48.95	16 14.48	67.21	14 26.47	0.015	
Frid.	11	21 40 45.59	9.840	13 54 37.8	49.53	16 14.29	67.10	14 26.46	0.016	
Sat.	12	21 44 41.38	9.809	13 34 42.0	50.10	16 14.10	66.99	14 25.70	0.047	
SUN.	13	21 48 36.43	9.778	13 14 32.8	+50.65	16 13.90	66.88	14 24.20	0.078	
Mon.	14	21 52 30.75	9.748	12 54 10.5	51.19	16 13.70	66.77	14 21.97	0.108	
Tues.	15	21 56 24.35	9.718	12 33 35.7	51.70	16 13.49	66.67	14 19.02	0.137	
Wed.	16	22 0 17.25	9.689	12 12 48.7	+52.20	16 13.28	66.57	14 15.38	0.166	
Thur.	17	22 4 9.45	9.660	11 51 49.9	52.68	16 13.06	66.47	14 11.03	0.195	
Frid.	18	22 8 0.96	9.632	11 30 39.8	53.15	16 12.85	66.37	14 6.00	0.223	
Sat.	19	22 11 51.80	9.604	11 9 18.8	+53.59	16 12.63	66.27	14 0.31	0.251	
SUN.	20	22 15 41.97	9.577	10 47 47.3	54.02	16 12.41	66.17	13 53.93	0.279	
Mon.	21	22 19 31.49	9.550	10 26 5.9	54.43	16 12.19	66.08	13 46.93	0.306	
Tues.	22	22 23 20.36	9.523	10 4 14.9	+54.82	16 11.97	65.99	13 39.26	0.332	
Wed.	23	22 27 8.61	9.497	9 42 14.8	55.19	16 11.74	65.90	13 30.98	0.358	
Thur.	24	22 30 56.24	9.472	9 20 5.9	55.54	16 11.52	65.81	13 22.08	0.384	
Frid.	25	22 34 43.26	9.447	8 57 48.8	+55.88	16 11.29	65.73	13 12.57	0.408	
Sat.	26	22 38 29.70	9.423	8 35 23.8	56.20	16 11.06	65.65	13 2.48	0.432	
SUN.	27	22 42 15.56	9.399	8 12 51.4	56.50	16 10.83	65.57	12 51.82	0.456	
Mon.	28	22 46 0.86	9.376	7 50 11.9	56.78	16 10.60	65.49	12 40.60	0.479	
Tues.	29	22 49 45.62	9.354	S. 7 27 25.8	+57.05	16 10.36	65.42	12 28.85	0.501	

NOTE.—The mean time of semidiameter passing may be found by subtracting 0.18 from the sidereal time.

The sign + prefixed to the hourly change of declination indicates that south declinations are decreasing.

## PHASES OF THE MOON.

Pacific Standard Time.

○ Full Moon . . . Feb. 6 10 24.2 A. M.  
 ☾ Last Quarter . . . 13 4 34.7 P. M.  
 ● New Moon . . . 20 11 40.6 A. M.  
 ☽ First Quarter . . . 28 3 13.3 A. M.

☾ Apogee . . . . . Feb. 1 0.7 A. M.  
 ☾ Perigee . . . . . 16 11.3 P. M.  
 ☾ Apogee . . . . . 28 9.2 P. M.

Day of the Month.	Sidereal Time at Greenwich Mean Noon.	Chronometer Rate. G., if gaining. L., if losing.	Chronometer Error. F., if fast. S., if slow.	Noon Position.	
				Latitude.	Longitude.
1	h m s 20 46 51.20				
2	20 50 47.76				
3	20 54 44.31				
4	20 58 40.87				
5	21 2 37.42				
6	21 6 33.98				
7	21 10 30.53				
8	21 14 27.09				
9	21 18 23.64				
10	21 22 20.20				
11	21 26 16.76				
12	21 30 13.31				
13	21 34 9.86				
14	21 38 6.42				
15	21 42 2.98				
16	21 45 59.53				
17	21 49 56.08				
18	21 53 52.64				
19	21 57 49.19				
20	22 1 45.75				
21	22 5 42.30				
22	22 9 38.86				
23	22 13 35.41				
24	22 17 31.96				
25	22 21 28.52				
26	22 25 25.07				
27	22 29 21.62				
28	22 33 18.18				
29	22 37 14.73				
Diff. for 1 Hour, +9.8565. (Table II.)		NOTE.—The chronometer error and rate should be entered opposite the date of their determination in port, whether by observation, time-ball, or comparison. The same rate, with the accumulated or diminished error, should be entered on every successive day until a new rate and new error have been ascertained.			

## AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S					Sideral Time of Semi-diameter Passing Meridian.	Equation of Time, to be Added to Apparent Time.	Diff. for 1 Hour.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semi-diameter.			
		<sup>h</sup> <sup>m</sup> <sup>s</sup>	<sup>s</sup>	<sup>°</sup> <sup>'</sup> <sup>"</sup>	<sup>"</sup>	<sup>'</sup> <sup>"</sup>	<sup>s</sup>	<sup>m</sup> <sup>s</sup>	<sup>s</sup>
Tues.	1	22 49 45.62	9.354	S. 7 27 25.8	+57.05	16 10.36	65.42	12 28.85	0.501
Wed.	2	22 53 29.86	9.333	7 4 33.4	57.30	16 10.12	65.35	12 16.55	0.522
Thur.	3	22 57 13.60	9.313	6 41 35.2	57.54	16 9.88	65.28	12 3.78	0.542
Frid.	4	23 0 56.86	9.293	6 18 31.4	+57.76	16 9.64	65.21	11 50.52	0.561
Sat.	5	23 4 39.66	9.274	5 55 22.6	57.97	16 9.39	65.15	11 36.80	0.580
SUN.	6	23 8 22.02	9.256	5 32 8.9	58.16	16 9.14	65.09	11 22.65	0.598
Mon.	7	23 12 3.96	9.240	5 8 50.8	+58.34	16 8.88	65.03	11 8.09	0.615
Tues.	8	23 15 45.52	9.224	4 45 28.7	58.50	16 8.62	64.97	10 53.11	0.631
Wed.	9	23 19 26.70	9.209	4 22 2.9	58.65	16 8.36	64.91	10 37.79	0.645
Thur.	10	23 23 7.55	9.195	3 58 33.7	+58.78	16 8.10	64.86	10 22.14	0.659
Frid.	11	23 26 48.07	9.182	3 35 1.5	58.90	16 7.84	64.82	10 6.14	0.672
Sat.	12	23 30 28.29	9.170	3 11 26.7	59.00	16 7.57	64.78	9 49.86	0.684
SUN.	13	23 34 8.24	9.159	2 47 49.6	+59.09	16 7.30	64.74	9 33.30	0.695
Mon.	14	23 37 47.94	9.149	2 24 10.5	59.16	16 7.03	64.70	9 16.48	0.705
Tues.	15	23 41 27.40	9.140	2 0 29.9	59.22	16 6.75	64.66	8 59.44	0.714
Wed.	16	23 45 6.65	9.132	1 36 48.2	+59.26	16 6.48	64.63	8 42.19	0.722
Thur.	17	23 48 45.72	9.124	1 13 5.6	59.28	16 6.20	64.60	8 24.76	0.730
Frid.	18	23 52 24.60	9.117	0 49 22.7	59.29	16 5.92	64.57	8 7.13	0.737
Sat.	19	23 56 3.34	9.111	0 25 39.7	+59.28	16 5.64	64.54	7 49.37	0.743
SUN.	20	23 59 41.94	9.106	S. 0 1 57.0	59.26	16 5.36	64.52	7 31.46	0.749
Mon.	21	0 3 20.43	9.102	N. 0 21 44.8	59.22	16 5.09	64.50	7 13.44	0.753
Tues.	22	0 6 58.81	9.098	0 45 25.6	+59.17	16 4.81	64.49	6 55.32	0.756
Wed.	23	0 10 37.12	9.096	1 9 4.8	59.10	16 4.54	64.48	6 37.13	0.759
Thur.	24	0 14 15.35	9.092	1 32 42.2	59.01	16 4.26	64.48	6 18.85	0.762
Frid.	25	0 17 53.53	9.090	1 56 17.2	+58.91	16 3.99	64.48	6 0.53	0.764
Sat.	26	0 21 31.68	9.089	2 19 49.6	58.79	16 3.72	64.48	5 42.19	0.765
SUN.	27	0 25 9.82	9.089	2 43 18.9	58.65	16 3.45	64.48	5 23.81	0.766
Mon.	28	0 28 47.95	9.089	3 6 44.8	+58.50	16 3.18	64.48	5 5.44	0.765
Tues.	29	0 32 26.11	9.091	3 30 7.0	58.34	16 2.91	64.49	4 47.10	0.763
Wed.	30	0 36 4.30	9.093	3 53 25.1	58.16	16 2.64	64.50	4 28.78	0.762
Thur.	31	0 39 42.55	9.096	4 16 38.8	57.97	16 2.37	64.51	4 10.54	0.760
Frid.	32	0 43 20.88	9.099	N. 4 39 47.7	+57.77	16 2.10	64.53	3 52.37	0.756

NOTE.—The mean time of semidiameter passing may be found by subtracting 0.18 from the sideral time.

The sign + prefixed to the hourly change of declination indicates that south declinations are decreasing; north declinations, increasing.

PHASES OF THE MOON.

Pacific Standard Time.

○ Full Moon . March    d   h   m  
 8   1   28.7 A. M.  
 ☾ Last Quarter . . . 14 11 48.0 P. M.  
 ● New Moon . . . . 22   0   37.1 A. M.  
 ☽ First Quarter . . . 29 11 40.2 P. M.

☾ Perigee . . . . March    d   h  
 14   6.9 A. M.  
 ☽ Apogee . . . . . 28   5.5 P. M.

Day of the Month.	Sidereal Time at Greenwich Mean Noon.	Chronometer Rate. G., if gaining. L., if losing.	Chronometer Error. F., if fast. S., if slow.	Noon Position.	
				Latitude.	Longitude.
1	h m s 22 37 14.73				
2	22 41 11.29				
3	22 45 7.84				
4	22 49 4.39				
5	22 53 0.95				
6	22 56 57.50				
7	23 0 54.05				
8	23 4 50.61				
9	23 8 47.16				
10	23 12 43.71				
11	23 16 40.27				
12	23 20 36.82				
13	23 24 33.37				
14	23 28 29.93				
15	23 32 26.48				
16	23 36 23.03				
17	23 40 19.58				
18	23 44 16.14				
19	23 48 12.69				
20	23 52 9.24				
21	23 56 5.80				
22	0 0 2.35				
23	0 3 58.90				
24	0 7 55.46				
25	0 11 52.01				
26	0 15 48.56				
27	0 19 45.12				
28	0 23 41.67				
29	0 27 38.22				
30	0 31 34.78				
31	0 35 31.33				
32	0 39 27.88				

Diff. for 1 Hour,  
 +9.8565.  
 (Table II.)

NOTE.—The chronometer error and rate should be entered opposite the date of their determination in port, whether by observation, time-ball, or comparison. The same rate, with the accumulated or diminished error, should be entered on every successive day until a new rate and new error have been ascertained.

## AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S						Equation of Time, to be Added to	Diff. for 1 Hour.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semi-diameter.	Sidereal Time of Semi-diameter Passing Meridian.	Subtracted from Apparent Time.	
Frid.	1	<sup>h</sup> 0 <sup>m</sup> 43 <sup>s</sup> 20.88	9.099	N. 4 39 47.7	+57.77	16 2.10	64.53	<sup>m</sup> 3 52.37	0.756
Sat.	2	0 46 59.31	9.103	5 2 51.5	57.55	16 1.82	64.55	3 34.29	0.751
SUN.	3	0 50 37.86	9.109	5 25 49.9	57.31	16 1.55	64.57	3 16.33	0.745
Mon.	4	0 54 16.55	9.116	5 48 42.5	+57.06	16 1.28	64.59	2 58.52	0.739
Tues.	5	0 57 55.40	9.123	6 11 29.1	56.81	16 1.01	64.62	2 40.86	0.731
Wed.	6	1 1 34.44	9.131	6 34 9.3	56.54	16 0.73	64.65	2 23.39	0.723
Thur.	7	1 5 13.68	9.140	6 56 42.8	+56.25	16 0.46	64.68	2 6.14	0.714
Frid.	8	1 8 53.15	9.150	7 19 9.3	55.95	16 0.18	64.71	1 49.09	0.705
Sat.	9	1 12 32.87	9.161	7 41 28.4	55.64	15 59.90	64.75	1 32.30	0.694
SUN.	10	1 16 12.86	9.173	8 3 39.9	+55.31	15 59.62	64.79	1 15.79	0.682
Mon.	11	1 19 53.14	9.185	8 25 43.4	54.97	15 59.34	64.83	0 59.56	0.669
Tues.	12	1 23 33.74	9.198	8 47 38.7	54.62	15 59.07	64.87	0 43.64	0.656
Wed.	13	1 27 14.66	9.212	9 9 25.2	+54.25	15 58.79	64.92	0 28.06	0.642
Thur.	14	1 30 55.92	9.227	9 31 2.8	53.87	15 58.52	64.97	0 12.81	0.628
Frid.	15	1 34 37.55	9.242	9 52 31.0	53.47	15 58.25	65.02	0 2.08	0.612
Sat.	16	1 38 19.55	9.258	10 13 49.5	+53.06	15 57.98	65.07	0 16.60	0.596
SUN.	17	1 42 1.94	9.275	10 34 58.0	52.64	15 57.71	65.13	0 30.71	0.580
Mon.	18	1 45 44.73	9.292	10 55 56.0	52.20	15 57.44	65.19	0 44.44	0.563
Tues.	19	1 49 27.94	9.309	11 16 43.4	+51.74	15 57.18	65.25	0 57.75	0.546
Wed.	20	1 53 11.56	9.327	11 37 19.6	51.27	15 56.92	65.31	1 10.64	0.528
Thur.	21	1 56 55.63	9.345	11 57 44.4	50.79	15 56.66	65.37	1 23.11	0.510
Frid.	22	2 0 40.13	9.364	12 17 57.3	+50.29	15 56.40	65.44	1 35.12	0.491
Sat.	23	2 4 25.08	9.383	12 37 58.1	49.77	15 56.15	65.50	1 46.70	0.472
SUN.	24	2 8 10.49	9.402	12 57 46.4	49.24	15 55.90	65.57	1 57.80	0.453
Mon.	25	2 11 56.37	9.421	13 17 21.8	+48.70	15 55.65	65.64	2 8.45	0.434
Tues.	26	2 15 42.72	9.441	13 36 44.1	48.15	15 55.41	65.71	2 18.63	0.414
Wed.	27	2 19 29.55	9.462	13 55 52.9	47.58	15 55.17	65.78	2 28.33	0.394
Thur.	28	2 23 16.88	9.482	14 14 47.8	+47.00	15 54.93	65.85	2 37.53	0.373
Frid.	29	2 27 4.70	9.503	14 33 28.7	46.40	15 54.70	65.93	2 46.24	0.352
Sat.	30	2 30 53.03	9.524	14 51 55.1	45.79	15 54.47	66.01	2 54.44	0.331
SUN.	31	2 34 41.88	9.546	N. 15 10 6.8	+45.18	15 54.24	66.09	3 2.13	0.310

NOTE.—The mean time of semidiameter passing may be found by subtracting 0.18 from the sidereal time.

The sign + prefixed to the hourly change of declination indicates that north declinations are increasing.

## PHASES OF THE MOON.

Pacific Standard Time.

○ Full Moon . . . April 6 1 19.6 P. M.  
 ☾ Last Quarter . . . 13 6 28.4 A. M.  
 ● New Moon . . . . 20 2 20.7 P. M.  
 ☽ First Quarter . . . 28 6 4.7 P. M.

☾ Perigee . . . . April 9 2.2 P. M.  
 ☾ Apogee . . . . 25 11.4 A. M.

Day of the Month.	Sidereal Time at Greenwich Mean Noon.	Chronometer Rate. G., if gaining. L., if losing.	Chronometer Error. F., if fast. S., if slow.	Noon Position.	
				Latitude.	Longitude.
1	h m s 0 39 27.88				
2	0 43 24.44				
3	0 47 20.99				
4	0 51 17.54				
5	0 55 14.10				
6	0 59 10.65				
7	1 3 7.20				
8	1 7 3.76				
9	1 11 0.31				
10	1 14 56.86				
11	1 18 53.42				
12	1 22 49.97				
13	1 26 46.52				
14	1 30 43.08				
15	1 34 39.63				
16	1 38 36.19				
17	1 42 32.74				
18	1 46 29.30				
19	1 50 25.85				
20	1 54 22.40				
21	1 58 18.96				
22	2 2 15.51				
23	2 6 12.07				
24	2 10 8.62				
25	2 14 5.18				
26	2 18 1.73				
27	2 21 58.29				
28	2 25 54.84				
29	2 29 51.40				
30	2 33 47.95				
31	2 37 44.51				

Diff. for 1 Hour,  
 +9.8565.  
 (Table II.)

NOTE.—The chronometer error and rate should be entered opposite the date of their determination in port, whether by observation, time-ball, or comparison. The same rate, with the accumulated or diminished error, should be entered on every successive day until a new rate and new error have been ascertained.

## AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S					Sidereal Time of Semi-diameter Passing Meridian.	Equation of Time, to be Subtracted from Apparent Time.	Diff. for 1 Hour.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semi-diameter.			
<i>SUN.</i>	1	<sup>h</sup> 2 <sup>m</sup> 34 <sup>s</sup> 41.88	9.546	N. 15 10 6.8	+45.18	15 54.24	66.09	<sup>m</sup> 3 <sup>s</sup> 2.13	0.310
Mon.	2	2 38 31.24	9.568	15 28 3.4	44.55	15 54.01	66.17	3 9.29	0.288
Tues.	3	2 42 21.15	9.591	15 45 44.7	43.90	15 53.78	66.25	3 15.93	0.265
Wed.	4	2 46 11.60	9.614	16 3 10.4	+43.24	15 53.55	66.33	3 22.03	0.242
Thur.	5	2 50 2.60	9.637	16 20 20.2	42.57	15 53.32	66.41	3 27.56	0.219
Frid.	6	2 53 54.17	9.660	16 37 13.7	41.89	15 53.10	66.50	3 32.54	0.195
Sat.	7	2 57 46.30	9.684	16 53 50.8	+41.19	15 52.87	66.58	3 36.94	0.172
<i>SUN.</i>	8	3 1 39.01	9.708	17 10 11.0	40.48	15 52.65	66.66	3 40.78	0.148
Mon.	9	3 5 32.31	9.733	17 26 14.2	39.77	15 52.43	66.74	3 44.03	0.124
Tues.	10	3 9 26.19	9.757	17 42 0.0	+39.04	15 52.21	66.82	3 46.70	0.099
Wed.	11	3 13 20.66	9.782	17 57 28.2	38.30	15 51.99	66.90	3 48.78	0.075
Thur.	12	3 17 15.73	9.807	18 12 38.3	37.55	15 51.78	66.98	3 50.26	0.050
Frid.	13	3 21 11.39	9.832	18 27 30.2	+36.78	15 51.57	67.06	3 51.16	0.025
Sat.	14	3 25 7.65	9.857	18 42 3.6	36.00	15 51.37	67.14	3 51.46	0.000
<i>SUN.</i>	15	3 29 4.50	9.881	18 56 18.1	35.21	15 51.16	67.22	3 51.15	0.025
Mon.	16	3 33 1.94	9.905	19 10 13.4	+34.41	15 50.96	67.30	3 50.28	0.049
Tues.	17	3 36 59.96	9.929	19 23 49.4	33.59	15 50.76	67.38	3 48.82	0.073
Wed.	18	3 40 58.55	9.953	19 37 5.6	32.76	15 50.57	67.46	3 46.79	0.096
Thur.	19	3 44 57.71	9.977	19 50 1.8	+31.92	15 50.38	67.54	3 44.19	0.120
Frid.	20	3 48 57.43	10.000	20 2 37.8	31.07	15 50.20	67.62	3 41.05	0.143
Sat.	21	3 52 57.69	10.022	20 14 53.2	30.21	15 50.02	67.70	3 37.34	0.165
<i>SUN.</i>	22	3 56 58.49	10.044	20 26 47.9	+29.34	15 49.85	67.77	3 33.12	0.187
Mon.	23	4 0 59.80	10.065	20 38 21.5	28.46	15 49.68	67.84	3 28.38	0.208
Tues.	24	4 5 1.62	10.086	20 49 33.8	27.57	15 49.52	67.91	3 23.12	0.229
Wed.	25	4 9 3.94	10.107	21 0 24.7	+26.67	15 49.36	67.98	3 17.37	0.249
Thur.	26	4 13 6.74	10.126	21 10 53.8	25.76	15 49.20	68.05	3 11.16	0.269
Frid.	27	4 17 10.00	10.145	21 21 1.0	24.84	15 49.05	68.12	3 4.48	0.288
Sat.	28	4 21 13.71	10.164	21 30 46.0	+23.91	15 48.91	68.18	2 57.34	0.306
<i>SUN.</i>	29	4 25 17.86	10.182	21 40 8.6	22.98	15 48.77	68.24	2 49.77	0.324
Mon.	30	4 29 22.44	10.199	21 49 8.8	22.04	15 48.63	68.30	2 41.77	0.342
Tues.	31	4 33 27.43	10.216	21 57 46.2	21.08	15 48.49	68.36	2 33.36	0.359
Wed.	32	4 37 32.82	10.232	N. 22 6 0.7	+20.12	15 48.36	68.42	2 24.55	0.375

NOTE.—The mean time of semidiameter passing may be found by subtracting 0°.18 from the sidereal time.

The sign + prefixed to the hourly change of declination indicates that north declinations are increasing.

## PHASES OF THE MOON.

Pacific Standard Time.

		d	h	m	
○ Full Moon . . .	May	5	10	33.7	P. M.
☾ Last Quarter . . .		12	1	35.8	P. M.
● New Moon . . .		20	4	58.2	A. M.
☾ First Quarter . . .		28	9	13.9	A. M.

		d	h	
☾ Perigee . . . . .	May	7	12.8	P. M.
☾ Apogee . . . . .		23	0.5	A. M.

Date of the Month.	Sidereal Time at Greenwich Mean Noon.	Chronometer Rate. G., if gaining. L., if losing.	Chronometer Error. F., if fast. S., if slow.	Noon Position.	
				Latitude.	Longitude.
1	h m s 2 37 44.51				
2	2 41 41.06				
3	2 45 37.62				
4	2 49 34.18				
5	2 53 30.73				
6	2 57 27.29				
7	3 1 23.84				
8	3 5 20.40				
9	3 9 16.95				
10	3 13 13.51				
11	3 17 10.07				
12	3 21 6.62				
13	3 25 3.18				
14	3 28 59.74				
15	3 32 56.29				
16	3 36 52.85				
17	3 40 49.40				
18	3 44 45.96				
19	3 48 42.52				
20	3 52 39.08				
21	3 56 35.63				
22	4 0 32.19				
23	4 4 28.75				
24	4 8 25.30				
25	4 12 21.86				
26	4 16 18.42				
27	4 20 14.98				
28	4 24 11.53				
29	4 28 8.09				
30	4 32 4.65				
31	4 36 1.21				
32	4 39 57.76				
Diff. for 1 Hour, +9.8565. (Table II.)		NOTE.—The chronometer error and rate should be entered opposite the date of their determination in port, whether by observation, time-ball, or comparison. The same rate, with the accumulated or diminished error, should be entered on every successive day until a new rate and new error have been ascertained.			

## AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S						Sideral Time of Semi-diameter Passing Meridian.	Equation of Time, to be Subtracted from		Diff. for 1 Hour.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semi-diameter.	Added to Apparent Time.				
		<sup>h</sup> <sup>m</sup> <sup>s</sup>	<sup>s</sup>	<sup>°</sup> <sup>'</sup> <sup>"</sup>	<sup>"</sup>	<sup>'</sup> <sup>"</sup>	<sup>s</sup>	<sup>m</sup> <sup>s</sup>	<sup>s</sup>		
Wed.	1	4 37 32.82	10.232	N.22 6 0.7	+20.12	15 48.36	68.42	2 24.55	0.375		
Thur.	2	4 41 38.60	10.248	22 13 52.2	19.16	15 48.23	68.48	2 15.36	0.390		
Frid.	3	4 45 44.74	10.263	22 21 20.4	18.19	15 48.11	68.53	2 5.80	0.405		
Sat.	4	4 49 51.25	10.278	22 28 25.3	+17.21	15 47.98	68.58	1 55.87	0.420		
SUN.	5	4 53 58.11	10.292	22 35 6.6	16.23	15 47.86	68.63	1 45.59	0.435		
Mon.	6	4 58 5.29	10.306	22 41 24.3	15.24	15 47.74	68.67	1 35.00	0.448		
Tues.	7	5 2 12.79	10.319	22 47 18.1	+14.24	15 47.62	68.71	1 24.09	0.461		
Wed.	8	5 6 20.59	10.331	22 52 48.0	13.24	15 47.51	68.75	1 12.88	0.473		
Thur.	9	5 10 28.67	10.342	22 57 53.8	12.24	15 47.40	68.78	1 1.39	0.485		
Frid.	10	5 14 37.02	10.353	23 2 35.3	+11.23	15 47.29	68.81	0 49.62	0.495		
Sat.	11	5 18 45.61	10.362	23 6 52.6	10.21	15 47.19	68.84	0 37.63	0.504		
SUN.	12	5 22 54.43	10.371	23 10 45.5	9.19	15 47.09	68.87	0 25.41	0.513		
Mon.	13	5 27 3.44	10.379	23 14 13.8	+ 8.17	15 47.00	68.89	0 12.98	0.521		
Tues.	14	5 31 12.64	10.386	23 17 17.6	7.14	15 46.91	68.91	0 0.38	0.528		
Wed.	15	5 35 21.99	10.392	23 19 56.7	6.11	15 46.82	68.92	0 12.37	0.534		
Thur.	16	5 39 31.46	10.397	23 22 11.0	+ 5.08	15 46.74	68.93	0 25.26	0.538		
Frid.	17	5 43 41.04	10.401	23 24 0.6	4.05	15 46.67	68.94	0 38.25	0.542		
Sat.	18	5 47 50.68	10.403	23 25 25.4	3.02	15 46.60	68.95	0 51.29	0.545		
SUN.	19	5 52 0.37	10.404	23 26 25.4	+ 1.99	15 46.54	68.96	1 4.39	0.546		
Mon.	20	5 56 10.08	10.404	23 27 0.6	+ 0.95	15 46.48	68.96	1 17.50	0.546		
Tues.	21	6 0 19.78	10.403	23 27 10.9	- 0.09	15 46.43	68.96	1 30.61	0.545		
Wed.	22	6 4 29.44	10.401	23 26 56.4	- 1.12	15 46.39	68.95	1 43.68	0.543		
Thur.	23	6 8 39.04	10.398	23 26 17.1	2.16	15 46.35	68.94	1 56.68	0.540		
Frid.	24	6 12 48.54	10.393	23 25 13.0	3.19	15 46.31	68.93	2 9.59	0.535		
Sat.	25	6 16 57.92	10.387	23 23 44.2	- 4.22	15 46.28	68.92	2 22.37	0.530		
SUN.	26	6 21 7.16	10.381	23 21 50.8	5.24	15 46.26	68.90	2 35.02	0.524		
Mon.	27	6 25 16.23	10.374	23 19 32.7	6.26	15 46.24	68.88	2 47.49	0.516		
Tues.	28	6 29 25.12	10.366	23 16 50.1	- 7.28	15 46.22	68.86	2 59.80	0.507		
Wed.	29	6 33 33.79	10.356	23 13 43.0	8.30	15 46.21	68.83	3 11.87	0.498		
Thur.	30	6 37 42.22	10.346	23 10 11.6	9.32	15 46.20	68.80	3 23.72	0.488		
Frid.	31	6 41 50.41	10.335	N.23 6 15.9	-10.32	15 46.19	68.77	3 35.32	0.478		

NOTE.—The mean time of semidiameter passing may be found by subtracting 0.19 from the sideral time.

The sign + prefixed to the hourly change of declination indicates that north declinations are increasing; the sign - indicates that north declinations are decreasing.

## PHASES OF THE MOON.

Pacific Standard Time.

○ Full Moon . . . June 4 6 11.3 A. M.  
 ☾ Last Quarter . . . 10 10 4.1 P. M.  
 ● New Moon . . . 18 8 19.3 P. M.  
 ☽ First Quarter . . . 26 8 54.0 P. M.

☾ Perigee . . . . . June 4 8.4 P. M.  
 ☾ Apogee . . . . . 19 6.0 A. M.

Day of the Month.	Sidereal Time at Greenwich Mean Noon.	Chronometer Rate. G., if gaining. L., if losing.	Chronometer Error. F., if fast. S., if slow.	Noon Position.	
				Latitude.	Longitude.
1	h m s 4 39 57.76				
2	4 43 54.32				
3	4 47 50.88				
4	4 51 47.44				
5	4 55 43.99				
6	4 59 40.55				
7	5 3 37.11				
8	5 7 33.67				
9	5 11 30.23				
10	5 15 26.78				
11	5 19 23.34				
12	5 23 19.90				
13	5 27 16.46				
14	5 31 13.02				
15	5 35 9.58				
16	5 39 6.13				
17	5 43 2.69				
18	5 46 59.25				
19	5 50 55.81				
20	5 54 52.37				
21	5 58 48.92				
22	6 2 45.48				
23	6 6 42.04				
24	6 10 38.60				
25	6 14 35.16				
26	6 18 31.72				
27	6 22 28.28				
28	6 26 24.83				
29	6 30 21.39				
30	6 34 17.95				
31	6 38 14.51				

Diff. for 1 Hour,  
 +9.8565.  
 (Table II.)

NOTE.—The chronometer error and rate should be entered opposite the date of their determination in port, whether by observation, time-ball, or comparison. The same rate, with the accumulated or diminished error, should be entered on every successive day until a new rate and new error have been ascertained.

## AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S					Sidereal Time of Semi-diameter Passing Meridian.	Equation of Time, to be Added to Apparent Time.	Diff. for 1 Hour.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semi-diameter.			
<b>Frid.</b>	<b>1</b>	<sup>h</sup> 6 <sup>m</sup> 41 <sup>s</sup> 50.41	10.335	N. 23 6 15.9	-10.32	15 46.19	68.77	<sup>m</sup> 3 <sup>s</sup> 35.32	0.478
<b>Sat.</b>	<b>2</b>	6 45 58.33	10.324	23 1 56.0	11.33	15 46.19	68.73	3 46.65	0.467
<b>SUN.</b>	<b>3</b>	6 50 5.96	10.312	22 57 12.0	12.33	15 46.19	68.69	3 57.69	0.455
<b>Mon.</b>	<b>4</b>	6 54 13.30	10.299	22 52 4.0	-13.33	15 46.20	68.65	4 8.43	0.442
<b>Tues.</b>	<b>5</b>	6 58 20.31	10.285	22 46 32.1	14.32	15 46.21	68.63	4 18.86	0.428
<b>Wed.</b>	<b>6</b>	7 2 26.99	10.271	22 40 36.5	15.31	15 46.22	68.55	4 28.95	0.414
<b>Thur.</b>	<b>7</b>	7 6 33.31	10.256	22 34 17.3	-16.29	15 46.23	68.50	4 38.69	0.399
<b>Frid.</b>	<b>8</b>	7 10 39.28	10.240	22 27 34.6	17.27	15 46.25	68.45	4 48.08	0.383
<b>Sat.</b>	<b>9</b>	7 14 44.86	10.224	22 20 28.6	18.24	15 46.27	68.39	4 57.07	0.367
<b>SUN.</b>	<b>10</b>	7 18 50.04	10.208	22 12 59.4	-19.20	15 46.29	68.33	5 5.68	0.350
<b>Mon.</b>	<b>11</b>	7 22 54.82	10.190	22 5 7.1	20.15	15 46.32	68.27	5 13.87	0.333
<b>Tues.</b>	<b>12</b>	7 26 59.17	10.172	21 56 52.1	21.10	15 46.35	68.21	5 21.65	0.315
<b>Wed.</b>	<b>13</b>	7 31 3.07	10.153	21 48 14.3	-22.04	15 46.39	68.14	5 28.97	0.296
<b>Thur.</b>	<b>14</b>	7 35 6.51	10.134	21 39 14.2	22.97	15 46.43	68.07	5 35.84	0.276
<b>Frid.</b>	<b>15</b>	7 39 9.48	10.114	21 29 51.8	23.89	15 46.48	68.00	5 42.22	0.256
<b>Sat.</b>	<b>16</b>	7 43 11.96	10.093	21 20 7.4	-24.81	15 46.54	67.93	5 48.12	0.235
<b>SUN.</b>	<b>17</b>	7 47 13.93	10.071	21 10 1.1	25.71	15 46.60	67.86	5 53.53	0.214
<b>Mon.</b>	<b>18</b>	7 51 15.37	10.049	20 59 33.4	26.60	15 46.66	67.79	5 58.40	0.192
<b>Tues.</b>	<b>19</b>	7 55 16.28	10.026	20 48 44.3	-27.48	15 46.73	67.71	6 2.74	0.169
<b>Wed.</b>	<b>20</b>	7 59 16.63	10.003	20 37 34.1	28.36	15 46.81	67.63	6 6.52	0.146
<b>Thur.</b>	<b>21</b>	8 3 16.42	9.979	20 26 3.2	29.22	15 46.89	67.55	6 9.74	0.122
<b>Frid.</b>	<b>22</b>	8 7 15.63	9.955	20 14 11.8	-30.07	15 46.98	67.47	6 12.39	0.098
<b>Sat.</b>	<b>23</b>	8 11 14.25	9.930	20 2 0.0	30.91	15 47.07	67.39	6 14.45	0.074
<b>SUN.</b>	<b>24</b>	8 15 12.27	9.905	19 49 28.3	31.73	15 47.17	67.31	6 15.92	0.049
<b>Mon.</b>	<b>25</b>	8 19 9.69	9.880	19 36 36.8	-32.54	15 47.27	67.23	6 16.77	0.023
<b>Tues.</b>	<b>26</b>	8 23 6.50	9.854	19 23 26.0	33.35	15 47.38	67.14	6 17.01	0.002
<b>Wed.</b>	<b>27</b>	8 27 2.69	9.829	19 9 55.9	34.15	15 47.49	67.05	6 16.66	0.028
<b>Thur.</b>	<b>28</b>	8 30 58.26	9.803	18 56 6.9	-34.93	15 47.60	66.97	6 15.67	0.054
<b>Frid.</b>	<b>29</b>	8 34 53.22	9.777	18 41 59.3	35.70	15 47.72	66.88	6 14.07	0.079
<b>Sat.</b>	<b>30</b>	8 38 47.56	9.751	18 27 33.2	36.46	15 47.84	66.79	6 11.87	0.105
<b>SUN.</b>	<b>31</b>	8 42 41.27	9.725	18 12 49.1	37.21	15 47.96	66.70	6 9.04	0.131
<b>Mon.</b>	<b>32</b>	8 46 34.38	9.700	N. 17 57 47.2	-37.95	15 48.09	66.61	6 5.59	0.156

**NOTE.**—The mean time of semidiameter passing may be found by subtracting 0.19 from the sidereal time.

The sign — prefixed to the hourly change of declination indicates that north declinations are decreasing.

## PHASES OF THE MOON.

Pacific Standard Time.

		d	h	m
○ Full Moon . . .	July	3	1	12.1 P. M.
☾ Last Quarter . . .		10	8	42.8 A. M.
● New Moon . . .		18	11	47.2 A. M.
☾ First Quarter . . .		26	5	39.9 A. M.

		d	h
☾ Perigee . . . . .	July	3	6.1 A. M.
☾ Apogee . . . . .		16	10.0 A. M.
☾ Perigee . . . . .		31	2.6 P. M.

Day of the Month.	Sidereal Time at Greenwich Mean Noon.	Chronometer Rate. G., if gaining. L., if losing.	Chronometer Error. F., if fast. S., if slow.	Noon Position.	
				Latitude.	Longitude.
1	h m s 6 38 14.51				
2	6 42 11.06				
3	6 46 7.62				
4	6 50 4.18				
5	6 54 0.74				
6	6 57 57.30				
7	7 1 53.86				
8	7 5 50.41				
9	7 9 46.97				
10	7 13 43.53				
11	7 17 40.09				
12	7 21 36.64				
13	7 25 33.20				
14	7 29 29.76				
15	7 33 26.32				
16	7 37 22.88				
17	7 41 19.43				
18	7 45 15.99				
19	7 49 12.55				
20	7 53 9.10				
21	7 57 5.66				
22	8 1 2.22				
23	8 4 58.78				
24	8 8 55.33				
25	8 12 51.89				
26	8 16 48.45				
27	8 20 45.00				
28	8 24 41.56				
29	8 28 38.12				
30	8 32 34.67				
31	8 36 31.23				
32	8 40 27.78				
Diff. for 1 Hour, +9 <sup>s</sup> .8565. (Table II.)		NOTE.—The chronometer error and rate should be entered opposite the date of their determination in port, whether by observation, time-ball, or comparison. The same rate, with the accumulated or diminished error, should be entered on every successive day until a new rate and new error have been ascertained.			

## AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S					Sideral Time of Semi-diameter Passing Meridian.	Equation of Time, to be Added to	Diff. for 1 Hour.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semi-diameter.		Subtracted from Apparent Time.	
Mon.	1	<sup>h</sup> 8 <sup>m</sup> 46 <sup>s</sup> 34.38	9.700	N. 17 57 47.2	-37.95	15 48.09	66.61	<sup>m</sup> 6 <sup>s</sup> 5.59	0.156
Tues.	2	8 50 26.87	9.675	17 42 27.7	38.68	15 48.22	66.53	6 1.54	0.181
Wed.	3	8 54 18.76	9.650	17 26 50.9	39.39	15 48.35	66.45	5 56.88	0.206
Thur.	4	8 58 10.05	9.625	17 10 57.0	-40.09	15 48.49	66.37	5 51.64	0.231
Frid.	5	9 2 0.74	9.600	16 54 46.4	40.79	15 48.62	66.28	5 45.79	0.256
Sat.	6	9 5 50.85	9.576	16 38 19.3	41.47	15 48.76	66.19	5 39.36	0.280
SUN.	7	9 9 40.38	9.552	16 21 36.0	-42.14	15 48.90	66.10	5 32.35	0.304
Mon.	8	9 13 29.34	9.528	16 4 36.8	42.80	15 49.05	66.02	5 24.77	0.328
Tues.	9	9 17 17.72	9.505	15 47 22.0	43.44	15 49.20	65.93	5 16.63	0.351
Wed.	10	9 21 5.56	9.482	15 29 51.9	-44.07	15 49.36	65.85	5 7.92	0.374
Thur.	11	9 24 52.83	9.459	15 12 6.8	44.69	15 49.52	65.77	4 58.68	0.397
Frid.	12	9 28 39.56	9.436	14 54 6.9	45.29	15 49.68	65.69	4 48.88	0.420
Sat.	13	9 32 25.75	9.413	14 35 52.8	-45.88	15 49.84	65.61	4 38.54	0.442
SUN.	14	9 36 11.40	9.391	14 17 24.5	46.46	15 50.01	65.53	4 27.66	0.464
Mon.	15	9 39 56.53	9.369	13 58 42.6	47.03	15 50.19	65.45	4 16.27	0.486
Tues.	16	9 43 41.13	9.347	13 39 47.3	-47.58	15 50.37	65.38	4 4.35	0.508
Wed.	17	9 47 25.22	9.326	13 20 39.0	48.11	15 50.55	65.30	3 51.92	0.529
Thur.	18	9 51 8.80	9.305	13 1 17.9	48.63	15 50.74	65.23	3 38.97	0.550
Frid.	19	9 54 51.88	9.285	12 41 44.5	-49.14	15 50.93	65.16	3 25.54	0.570
Sat.	20	9 58 34.47	9.264	12 21 59.2	49.63	15 51.13	65.09	3 11.60	0.590
SUN.	21	10 2 16.57	9.244	12 2 2.1	50.11	15 51.33	65.02	2 57.19	0.610
Mon.	22	10 5 58.20	9.225	11 41 53.7	-50.58	15 51.54	64.95	2 42.30	0.630
Tues.	23	10 9 39.37	9.206	11 21 34.2	51.03	15 51.75	64.89	2 26.96	0.649
Wed.	24	10 13 20.08	9.188	11 1 4.2	51.47	15 51.96	64.83	2 11.17	0.667
Thur.	25	10 17 0.37	9.170	10 40 23.7	-51.90	15 52.18	64.77	1 54.94	0.685
Frid.	26	10 20 40.22	9.153	10 19 33.2	52.31	15 52.40	64.71	1 38.29	0.702
Sat.	27	10 24 19.68	9.136	9 58 32.9	52.71	15 52.62	64.66	1 21.23	0.719
SUN.	28	10 27 58.74	9.120	9 37 23.2	-53.10	15 52.84	64.61	1 3.80	0.735
Mon.	29	10 31 37.44	9.105	9 16 4.4	53.47	15 53.06	64.56	0 45.99	0.750
Tues.	30	10 35 15.78	9.091	8 54 36.8	53.83	15 53.29	64.51	0 27.82	0.764
Wed.	31	10 38 53.79	9.077	8 33 0.6	54.18	15 53.52	64.46	0 9.34	0.777
Thur.	32	10 42 31.49	9.065	N. 8 11 16.2	-54.52	15 53.75	64.41	0 9.48	0.789

NOTE.—The mean time of semidiameter passing may be found by subtracting 0.18 from the sideral time.

The sign — prefixed to the hourly change of declination indicates that north declinations are decreasing.

## PHASES OF THE MOON.

Pacific Standard Time.

○ Full Moon . . . . .	Aug.	d	h	m	
☾ Last Quarter . . . . .		8	10	13.0	P. M.
● New Moon . . . . .		17	2	34.1	A. M.
☾ First Quarter . . . . .		24	12	32.1	P. M.
○ Full Moon . . . . .		31	4	50.8	A. M.

☾ Apogee . . . . .	Aug.	d	h		P. M.
☾ Perigee . . . . .		28	5.3		P. M.

Day of the Month.	Sidereal Time at Greenwich Mean Noon.	Chronometer Rate. G., if gaining. L., if losing.	Chronometer Error. F., if fast. S., if slow.	Noon Position.	
				Latitude.	Longitude.
1	h m s 8 40 27.78				
2	8 44 24.34				
3	8 48 20.90				
4	8 52 17.45				
5	8 56 14.01				
6	9 0 10.56				
7	9 4 7.12				
8	9 8 3.68				
9	9 12 0.23				
10	9 15 56.79				
11	9 19 53.34				
12	9 23 49.90				
13	9 27 46.45				
14	9 31 43.01				
15	9 35 39.56				
16	9 39 36.12				
17	9 43 32.67				
18	9 47 29.23				
19	9 51 25.78				
20	9 55 22.34				
21	9 59 18.89				
22	10 3 15.45				
23	10 7 12.00				
24	10 11 8.56				
25	10 15 5.11				
26	10 19 1.66				
27	10 22 58.22				
28	10 26 54.77				
29	10 30 51.32				
30	10 34 47.88				
31	10 38 44.43				
32	10 42 40.99				
Diff. for 1 Hour, +9.8565. (Table II.)		NOTE.—The chronometer error and rate should be entered opposite the date of their determination in port, whether by observation, time-ball, or comparison. The same rate, with the accumulated or diminished error, should be entered on every successive day until a new rate and new error have been ascertained.			

## AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S						Sidereal Time of Semi-diameter Passing Meridian.	Equation of Time, to be Subtracted from Apparent Time.	Diff. for 1 Hour.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semi-diameter.				
Thur.	1	h m s 10 42 31.49	s 9.065	N. ° ' " 8 11 16.2	" -54.52	' " 15 53.75	s 64.41	m s 0 9.48	s 0.789	
Frid.	2	10 46 8.90	9.053	7 49 23.8	54.84	15 53.98	64.37	0 28.56	0.801	
Sat.	3	10 49 46.03	9.042	7 27 23.8	55.15	15 54.21	64.33	0 47.93	0.812	
SUN.	4	10 53 22.92	9.032	7 5 16.5	-55.45	15 54.44	64.29	1 7.54	0.822	
Mon.	5	10 56 59.57	9.023	6 43 2.1	55.74	15 54.68	64.26	1 27.39	0.831	
Tues.	6	11 0 36.02	9.015	6 20 41.0	56.01	15 54.92	64.23	1 47.43	0.839	
Wed.	7	11 4 12.28	9.007	5 58 13.4	-56.27	15 55.16	64.20	2 7.68	0.846	
Thur.	8	11 7 48.36	9.000	5 35 39.8	56.52	15 55.40	64.17	2 28.08	0.853	
Frid.	9	11 11 24.31	8.995	5 13 0.4	56.75	15 55.64	64.15	2 48.64	0.859	
Sat.	10	11 15 0.12	8.990	4 50 15.6	-56.97	15 55.88	64.13	3 9.33	0.864	
SUN.	11	11 18 35.82	8.985	4 27 25.8	57.18	15 56.13	64.11	3 30.13	0.869	
Mon.	12	11 22 11.42	8.981	4 4 31.1	57.37	15 56.38	64.09	3 51.02	0.873	
Tues.	13	11 25 46.94	8.979	3 41 32.1	-57.54	15 56.63	64.08	4 12.01	0.875	
Wed.	14	11 29 22.40	8.977	3 18 29.1	57.70	15 56.88	64.07	4 33.03	0.877	
Thur.	15	11 32 57.81	8.975	2 55 22.4	57.85	15 57.14	64.06	4 54.12	0.879	
Frid.	16	11 36 33.20	8.974	2 32 12.3	-57.98	15 57.40	64.06	5 15.21	0.880	
Sat.	17	11 40 8.57	8.974	2 8 59.4	58.09	15 57.67	64.06	5 36.35	0.880	
SUN.	18	11 43 43.95	8.974	1 45 43.8	58.19	15 57.94	64.06	5 57.46	0.880	
Mon.	19	11 47 19.35	8.976	1 22 26.0	-58.28	15 58.21	64.07	6 18.56	0.878	
Tues.	20	11 50 54.78	8.978	0 59 6.3	58.35	15 58.48	64.08	6 39.62	0.876	
Wed.	21	11 54 30.27	8.981	0 35 45.1	58.41	15 58.75	64.09	7 0.63	0.873	
Thur.	22	11 58 5.84	8.984	N. 0 12 22.7	-58.45	15 59.02	64.11	7 21.55	0.870	
Frid.	23	12 1 41.50	8.988	S. 0 11 0.5	58.48	15 59.30	64.13	7 42.40	0.865	
Sat.	24	12 5 17.28	8.993	0 34 24.3	58.49	15 59.58	64.15	8 3.11	0.860	
SUN.	25	12 8 53.18	8.999	0 57 48.3	-58.50	15 59.86	64.17	8 23.70	0.854	
Mon.	26	12 12 29.25	9.005	1 21 12.1	58.49	16 0.14	64.20	8 44.14	0.848	
Tues.	27	12 16 5.49	9.013	1 44 35.4	58.46	16 0.41	64.23	9 4.38	0.840	
Wed.	28	12 19 41.94	9.023	2 7 58.0	-58.42	16 0.69	64.26	9 24.44	0.831	
Thur.	29	12 23 18.61	9.033	2 31 19.4	58.36	16 0.97	64.30	9 44.26	0.821	
Frid.	30	12 26 55.53	9.044	2 54 39.4	58.29	16 1.25	64.34	10 3.84	0.810	
Sat.	31	12 30 32.73	9.056	S. 3 17 57.6	-58.21	16 1.52	64.38	10 23.14	0.798	

NOTE.—The mean time of semidiameter passing may be found by subtracting 0.18 from the sidereal time.

The sign — prefixed to the hourly change of declination indicates that north declinations are decreasing; south declinations, increasing.

PHASES OF THE MOON.

Pacific Standard Time.

☾ Last Quarter      Sept.      7      2      50.8 P. M.  
 ● New Moon      . . . . . 15      4      10.2 P. M.  
 ☽ First Quarter      . . . . . 22      6      39.4 P. M.  
 ○ Full Moon      . . . . . 29      3      10.5 P. M.

☾ Apogee      . . . . . Sept.      9      1.6 P. M.  
 ☾ Perigee      . . . . .      24      9.0 P. M.

Day of the Month.	Sidereal Time at Greenwich Mean Noon.	Chronometer Rate. G., if gaining. L., if losing.	Chronometer Error. F., if fast. S., if slow.	Noon Position.	
				Latitude.	Longitude.
1	h m s 10 42 40.99				
2	10 46 37.54				
3	10 50 34.09				
4	10 54 30.65				
5	10 58 27.20				
6	11 2 23.75				
7	11 6 20.31				
8	11 10 16.86				
9	11 14 13.41				
10	11 18 9.97				
11	11 22 6.52				
12	11 26 3.07				
13	11 29 59.63				
14	11 33 56.18				
15	11 37 52.73				
16	11 41 49.28				
17	11 45 45.84				
18	11 49 42.39				
19	11 53 38.94				
20	11 57 35.50				
21	12 1 32.05				
22	12 5 28.60				
23	12 9 25.16				
24	12 13 21.71				
25	12 17 18.26				
26	12 21 14.82				
27	12 25 11.37				
28	12 29 7.92				
29	12 33 4.47				
30	12 37 1.03				
31	12 40 57.58				

Diff. for 1 Hour,  
+9°.8565.  
(Table II.)

NOTE.—The chronometer error and rate should be entered opposite the date of their determination in port, whether by observation, time-ball, or comparison. The same rate, with the accumulated or diminished error, should be entered on every successive day until a new rate and new error have been ascertained.

## AT GREENWICH APPARENT NOON.

Day of the Week	Day of the Month	THE SUN'S					Sidereal Time of Semi-diameter Passing Meridian.	Equation of Time, to be Subtracted from Apparent Time.	Diff. for 1 Hour.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semi-diameter.			
		h m s	s	° ' "	"	' "	s	m s	s
Sat.	1	12 30 32.73	9.056	S. 3 17 57.6	-58.21	16 1.52	64.38	10 23.14	0.798
SUN.	2	12 34 10.22	9.069	3 41 13.7	58.11	16 1.80	64.43	10 42.15	0.786
Mon.	3	12 37 48.04	9.083	4 4 27.3	58.01	16 2.07	64.48	11 0.85	0.772
Tues.	4	12 41 26.20	9.098	4 27 38.2	-57.89	16 2.34	64.53	11 19.18	0.756
Wed.	5	12 45 4.73	9.114	4 50 46.0	57.75	16 2.61	64.58	11 37.16	0.740
Thur.	6	12 48 43.65	9.130	5 13 50.3	57.60	16 2.89	64.64	11 54.74	0.724
Frid.	7	12 52 22.98	9.148	5 36 50.7	-57.43	16 3.16	64.70	12 11.92	0.706
Sat.	8	12 56 2.75	9.166	5 59 46.9	57.25	16 3.43	64.76	12 28.65	0.688
SUN.	9	12 59 42.97	9.186	6 22 38.6	57.05	16 3.70	64.82	12 44.94	0.669
Mon.	10	13 3 23.66	9.206	6 45 25.3	-56.83	16 3.97	64.89	13 0.76	0.649
Tues.	11	13 7 4.84	9.227	7 8 6.6	56.60	16 4.24	64.96	13 16.08	0.628
Wed.	12	13 10 46.54	9.248	7 30 42.2	56.35	16 4.51	65.03	13 30.90	0.607
Thur.	13	13 14 28.75	9.270	7 53 11.6	-56.09	16 4.78	65.11	13 45.21	0.585
Frid.	14	13 18 11.50	9.292	8 15 34.5	55.81	16 5.05	65.19	13 58.97	0.562
Sat.	15	13 21 54.81	9.315	8 37 50.4	55.51	16 5.33	65.27	14 12.18	0.539
SUN.	16	13 25 38.68	9.340	8 59 59.0	-55.19	16 5.60	65.35	14 24.83	0.515
Mon.	17	13 29 23.13	9.365	9 21 59.8	54.86	16 5.88	65.44	14 36.89	0.491
Tues.	18	13 33 8.18	9.390	9 43 52.4	54.51	16 6.16	65.53	14 48.38	0.466
Wed.	19	13 36 53.83	9.415	10 5 36.4	-54.15	16 6.43	65.62	14 59.24	0.440
Thur.	20	13 40 40.11	9.441	10 27 11.5	53.77	16 6.71	65.71	15 9.51	0.414
Frid.	21	13 44 27.02	9.468	10 48 37.2	53.37	16 6.98	65.81	15 19.11	0.387
Sat.	22	13 48 14.57	9.495	11 9 53.2	-52.95	16 7.25	65.91	15 28.09	0.360
SUN.	23	13 52 2.79	9.523	11 30 59.0	52.52	16 7.52	66.01	15 36.41	0.331
Mon.	24	13 55 51.69	9.552	11 51 54.3	52.07	16 7.79	66.11	15 44.03	0.302
Tues.	25	13 59 41.28	9.581	12 12 38.7	-51.61	16 8.06	66.21	15 50.98	0.273
Wed.	26	14 3 31.58	9.611	12 33 11.8	51.13	16 8.33	66.31	15 57.22	0.244
Thur.	27	14 7 22.60	9.641	12 53 33.2	50.64	16 8.59	66.42	16 2.74	0.214
Frid.	28	14 11 14.36	9.672	13 13 42.5	-50.13	16 8.85	66.53	16 7.52	0.184
Sat.	29	14 15 6.87	9.704	13 33 39.3	49.60	16 9.11	66.64	16 11.55	0.152
SUN.	30	14 19 0.16	9.736	13 53 23.4	49.06	16 9.36	66.75	16 14.81	0.120
Mon.	31	14 22 54.22	9.769	14 12 54.2	48.50	16 9.61	66.87	16 17.29	0.087
Tues.	32	14 26 49.09	9.803	S. 14 32 11.4	-47.92	16 9.86	66.98	16 18.98	0.053

NOTE.—The mean time of semidiameter passing may be found by subtracting 0.18 from the sidereal time.

The sign — prefixed to the hourly change of declination indicates that south declinations are increasing

PHASES OF THE MOON.

Pacific Standard Time.

☾ Last Quarter . . . Oct. 7 10 4.7 A. M.  
 ● New Moon . . . . . 15 4 37.3 A. M.  
 ☽ First Quarter . . . . . 22 1 9.2 A. M.  
 ○ Full Moon . . . . . 29 4 18.2 A. M.

☾ Apogee . . . . . Oct. 7 8.9 A. M.  
 ☾ Perigee . . . . . 19 5.9 P. M.

Day of the Month.	Sidereal Time at Greenwich Mean Noon.	Chronometer Rate. G., if gaining. L., if losing.	Chronometer Error. F., if fast. S., if slow.	Noon Position.	
				Latitude.	Longitude.
1	h m s 12 40 57.58				
2	12 44 54.13				
3	12 48 50.69				
4	12 52 47.24				
5	12 56 43.79				
6	13 0 40.34				
7	13 4 36.90				
8	13 8 33.45				
9	13 12 30.00				
10	13 16 26.56				
11	13 20 23.11				
12	13 24 19.66				
13	13 28 16.22				
14	13 32 12.77				
15	13 36 9.33				
16	13 40 5.88				
17	13 44 2.43				
18	13 47 58.99				
19	13 51 55.54				
20	13 55 52.10				
21	13 59 48.65				
22	14 3 45.20				
23	14 7 41.76				
24	14 11 38.31				
25	14 15 34.86				
26	14 19 31.42				
27	14 23 27.98				
28	14 27 24.53				
29	14 31 21.08				
30	14 35 17.64				
31	14 39 14.19				
32	14 43 10.75				

Diff. for 1 Hour,  
 +9°.8565.  
 (Table II.)

NOTE.—The chronometer error and rate should be entered opposite the date of their determination in port, whether by observation, time-ball, or comparison. The same rate, with the accumulated or diminished error, should be entered on every successive day until a new rate and new error have been ascertained.

## AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S					Sideral Time of Semi-diameter Passing Meridian.	Equation of Time, to be Subtracted from Apparent Time.	Diff. for 1 Hour.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semi-diameter.			
Tues.	1	<sup>h</sup> 14 <sup>m</sup> 26 <sup>s</sup> 49.09	<sup>s</sup> 9.803	<sup>°</sup> S. 14 <sup>'</sup> 32 <sup>"</sup> 11.4	<sup>"</sup> -47.92	<sup>'</sup> 16 <sup>"</sup> 9.86	<sup>s</sup> 66.98	<sup>m</sup> 16 <sup>s</sup> 18.98	<sup>s</sup> 0.053
Wed.	2	14 30 44.77	9.837	14 51 14.6	47.33	16 10.10	67.09	16 19.85	0.019
Thur.	3	14 34 41.28	9.872	15 10 3.3	46.72	16 10.34	67.20	16 19.91	0.015
Frid.	4	14 38 38.61	9.907	15 28 37.3	-46.10	16 10.58	67.32	16 19.12	0.050
Sat.	5	14 42 36.80	9.942	15 46 56.0	45.46	16 10.82	67.43	16 17.49	0.085
SUN.	6	14 46 35.83	9.978	16 4 59.1	44.80	16 11.05	67.55	16 15.02	0.121
Mon.	7	14 50 35.73	10.014	16 22 46.2	-44.12	16 11.28	67.67	16 11.69	0.157
Tues.	8	14 54 36.49	10.050	16 40 16.8	43.42	16 11.50	67.79	16 7.50	0.193
Wed.	9	14 58 38.11	10.086	16 57 30.5	42.71	16 11.73	67.91	16 2.45	0.229
Thur.	10	15 2 40.60	10.122	17 14 26.9	-41.98	16 11.95	68.03	15 56.54	0.265
Frid.	11	15 6 43.95	10.158	17 31 5.6	41.23	16 12.17	68.15	15 49.75	0.301
Sat.	12	15 10 48.17	10.194	17 47 26.1	40.47	16 12.39	68.27	15 42.11	0.337
SUN.	13	15 14 53.25	10.229	18 3 28.1	-39.69	16 12.61	68.39	15 33.62	0.372
Mon.	14	15 18 59.18	10.265	18 19 11.2	38.89	16 12.82	68.51	15 24.26	0.407
Tues.	15	15 23 5.95	10.300	18 34 34.9	38.07	16 13.03	68.63	15 14.07	0.442
Wed.	16	15 27 13.57	10.335	18 49 38.8	-37.24	16 13.24	68.74	15 3.04	0.477
Thur.	17	15 31 22.01	10.369	19 4 22.5	36.39	16 13.45	68.86	14 51.19	0.511
Frid.	18	15 35 31.28	10.403	19 18 45.8	35.53	16 13.66	68.98	14 38.51	0.545
Sat.	19	15 39 41.36	10.437	19 32 48.0	-34.65	16 13.87	69.09	14 25.03	0.579
SUN.	20	15 43 52.24	10.470	19 46 29.1	33.76	16 14.07	69.20	14 10.74	0.612
Mon.	21	15 48 3.90	10.502	19 59 48.4	32.85	16 14.27	69.31	13 55.68	0.644
Tues.	22	15 52 16.35	10.535	20 12 45.8	-31.93	16 14.46	69.42	13 39.83	0.676
Wed.	23	15 56 29.57	10.567	20 25 20.9	30.99	16 14.65	69.53	13 23.21	0.708
Thur.	24	16 0 43.56	10.598	20 37 33.3	30.04	16 14.83	69.63	13 5.83	0.739
Frid.	25	16 4 58.29	10.629	20 49 22.6	-29.07	16 15.01	69.73	12 47.71	0.770
Sat.	26	16 9 13.75	10.660	21 0 48.6	28.09	16 15.19	69.83	12 28.86	0.801
SUN.	27	16 13 29.94	10.690	21 11 51.0	27.10	16 15.36	69.93	12 9.27	0.831
Mon.	28	16 17 46.84	10.719	21 22 29.4	-26.09	16 15.53	70.03	11 48.98	0.860
Tues.	29	16 22 4.45	10.748	21 32 43.6	25.07	16 15.69	70.12	11 27.99	0.889
Wed.	30	16 26 22.73	10.776	21 42 33.1	24.05	16 15.84	70.21	11 6.33	0.917
Thur.	31	16 30 41.68	10.803	S. 21 51 57.8	-23.01	16 15.99	70.30	10 44.00	0.943

NOTE.—The mean time of semidiameter passing may be found by subtracting 0.19 from the sideral time.

The sign — prefixed to the hourly change of declination indicates that south declinations are increasing.

PHASES OF THE MOON.

Pacific Standard Time.

☾ Last Quarter . . . Nov. 6 6 27.7 A. M.  
 ● New Moon . . . . . 13 4 20.3 P. M.  
 ☽ First Quarter . . . . . 20 9 4.9 A. M.  
 ○ Full Moon . . . . . 27 8 39.2 P. M.

☾ Apogee . . . . . Nov. 4 5.2 A. M.  
 ☾ Perigee . . . . . 15 11.7 P. M.

Day of the Month.	Sidereal Time at Greenwich Mean Noon.	Chronometer Rate. G., if gaining. L., if losing.	Chronometer Error. F., if fast. S., if slow.	Noon Position.	
				Latitude.	Longitude.
1	h m s 14 43 10.75				
2	14 47 7.30				
3	14 51 3.86				
4	14 55 0.41				
5	14 58 56.97				
6	15 2 53.52				
7	15 6 50.08				
8	15 10 46.64				
9	15 14 43.19				
10	15 18 39.75				
11	15 22 36.30				
12	15 26 32.86				
13	15 30 29.42				
14	15 34 25.97				
15	15 38 22.53				
16	15 42 19.08				
17	15 46 15.64				
18	15 50 12.20				
19	15 54 8.75				
20	15 58 5.31				
21	16 2 1.87				
22	16 5 58.42				
23	16 9 54.98				
24	16 13 51.54				
25	16 17 48.10				
26	16 21 44.65				
27	16 25 41.21				
28	16 29 37.77				
29	16 33 34.32				
30	16 37 30.88				
31	16 41 27.44				
Diff. for 1 Hour, +9°.8565. (Table II.)		NOTE.—The chronometer error and rate should be entered opposite the date of their determination in port, whether by observation, time-ball, or comparison. The same rate, with the accumulated or diminished error, should be entered on every successive day until a new rate and new error have been ascertained.			

## AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S						Sidereal Time of Semi-diameter Passing Meridian.	Equation of Time, to be Subtracted from		Diff. for 1 Hour.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semi-diameter.	Added to Apparent Time.				
Thur.	1	<sup>h</sup> 16 <sup>m</sup> 30 <sup>s</sup> 41.68	10.803	S. <sup>o</sup> 21 <sup>'</sup> 51 <sup>"</sup> 57.8	-23.01	<sup>'</sup> 16 <sup>"</sup> 15.99	<sup>s</sup> 70.30	<sup>m</sup> 10 <sup>s</sup> 44.00	<sup>s</sup> 0.943		
Frid.	2	16 35 1.28	10.830	22 0 57.3	21.95	16 16.13	70.39	10 21.02	0.970		
Sat.	3	16 39 21.52	10.856	22 9 31.4	20.88	16 16.27	70.47	9 57.40	0.996		
SUN.	4	16 43 42.36	10.881	22 17 39.9	-19.81	16 16.40	70.55	9 33.17	1.021		
Mon.	5	16 48 3.80	10.905	22 25 22.3	18.73	16 16.53	70.62	9 8.37	1.045		
Tues.	6	16 52 25.80	10.928	22 32 38.5	17.63	16 16.66	70.69	8 43.00	1.068		
Wed.	7	16 56 48.34	10.950	22 39 28.4	-16.52	16 16.78	70.75	8 17.09	1.090		
Thur.	8	17 1 11.38	10.971	22 45 51.5	15.40	16 16.89	70.81	7 50.66	1.111		
Frid.	9	17 5 34.92	10.990	22 51 47.7	14.28	16 17.00	70.87	7 23.77	1.130		
Sat.	10	17 9 58.90	11.008	22 57 16.8	-13.15	16 17.11	70.92	6 56.42	1.148		
SUN.	11	17 14 23.29	11.024	23 2 18.7	12.01	16 17.22	70.97	6 28.66	1.164		
Mon.	12	17 18 48.06	11.039	23 6 53.1	10.86	16 17.32	71.02	6 0.53	1.179		
Tues.	13	17 23 13.18	11.053	23 10 59.9	-9.71	16 17.42	71.07	5 32.04	1.193		
Wed.	14	17 27 38.62	11.065	23 14 39.0	8.55	16 17.51	71.12	5 3.24	1.205		
Thur.	15	17 32 4.32	11.076	23 17 50.1	7.39	16 17.60	71.16	4 34.18	1.216		
Frid.	16	17 36 30.26	11.085	23 20 33.4	-6.22	16 17.69	71.19	4 4.88	1.225		
Sat.	17	17 40 56.39	11.092	23 22 48.6	5.05	16 17.77	71.21	3 35.39	1.233		
SUN.	18	17 45 22.69	11.098	23 24 35.6	3.87	16 17.85	71.23	3 5.72	1.239		
Mon.	19	17 49 49.11	11.103	23 25 54.5	-2.69	16 17.93	71.25	2 35.94	1.243		
Tues.	20	17 54 15.61	11.106	23 26 45.2	1.52	16 18.00	71.26	2 6.08	1.246		
Wed.	21	17 58 42.18	11.107	23 27 7.6	-0.34	16 18.06	71.27	1 36.16	1.247		
Thur.	22	18 3 8.76	11.107	23 27 1.6	+0.83	16 18.12	71.27	1 6.22	1.247		
Frid.	23	18 7 35.32	11.106	23 26 27.5	2.01	16 18.18	71.27	0 36.29	1.246		
Sat.	24	18 12 1.85	11.104	23 25 25.1	3.19	16 18.23	71.26	0 6.42	1.244		
SUN.	25	18 16 28.29	11.100	23 23 54.4	+4.37	16 18.27	71.24	0 23.39	1.240		
Mon.	26	18 20 54.62	11.095	23 21 55.6	5.54	16 18.31	71.22	0 53.08	1.235		
Tues.	27	18 25 20.81	11.088	23 19 28.6	6.71	16 18.34	71.20	1 22.63	1.228		
Wed.	28	18 29 46.83	11.080	23 16 33.5	+7.88	16 18.36	71.18	1 52.01	1.220		
Thur.	29	18 34 12.66	11.072	23 13 10.4	9.04	16 18.38	71.16	2 21.20	1.211		
Frid.	30	18 38 38.26	11.062	23 9 19.4	10.20	16 18.39	71.13	2 50.18	1.201		
Sat.	31	18 43 3.61	11.050	23 5 0.6	11.36	16 18.40	71.09	3 18.89	1.190		
SUN.	32	18 47 28.68	11.037	S. 23 0 14.0	+12.52	16 18.40	71.04	3 47.32	1.178		

NOTE.—The mean time of semidiameter passing may be found by subtracting 0.19 from the sidereal time.

The sign — prefixed to the hourly change of declination indicates that south declinations are increasing; the sign + indicates that south declinations are decreasing.

PHASES OF THE MOON.

Pacific Standard Time.

☾ Last Quarter . Dec. 6 2 5.6 A. M.  
 ● New Moon . . . 13 3 43.1 A. M.  
 ☽ First Quarter . . . 19 7 21.6 P. M.  
 ○ Full Moon . . . 27 3 39.2 P. M.

☾ Apogee . . . . Dec. 1 11.8 P. M.  
 ☾ Perigee . . . . . 14 5.3 A. M.  
 ☾ Apogee . . . . . 29 10.4 A. M.

Day of the Month.	Sidereal Time at Greenwich Mean Noon.			Chronometer Rate. G., if gaining. L., if losing.	Chronometer Error. F., if fast. S., if slow.	Noon Position.	
	h	m	s			Latitude.	Longitude.
1	16	41	27.44				
2	16	45	24.00				
3	16	49	20.56				
4	16	53	17.11				
5	16	57	13.67				
6	17	1	10.23				
7	17	5	6.79				
8	17	9	3.34				
9	17	12	59.90				
10	17	16	56.46				
11	17	20	53.02				
12	17	24	49.58				
13	17	28	46.13				
14	17	32	42.69				
15	17	36	39.25				
16	17	40	35.81				
17	17	44	32.37				
18	17	48	28.92				
19	17	52	25.48				
20	17	56	22.04				
21	18	0	18.60				
22	18	4	15.16				
23	18	8	11.72				
24	18	12	8.28				
25	18	16	4.83				
26	18	20	1.39				
27	18	23	57.95				
28	18	27	54.51				
29	18	31	51.07				
30	18	35	47.62				
31	18	39	44.18				
32	18	43	40.74				

Diff. for 1 Hour,  
 +9".8565.  
 (Table II.)

NOTE.—The chronometer error and rate should be entered opposite the date of their determination in port, whether by observation, time-ball, or comparison. The same rate, with the accumulated or diminished error, should be entered on every successive day until a new rate and new error have been ascertained.

## MEAN PLACES FOR THE BEGINNING OF 1898.

Name of Star.	Magni- tude.	Right Ascension.			Annual Variation.	Declination.			Annual Variation.
		h	m	s	s	°	'	"	"
$\alpha$ Andromedæ . . . . .	2	0	3	6.85	+ 3.093	+ 28	31	38.2	+ 19.88
$\beta$ Cassiopeiæ . . . . .	2	0	3	44.01	3.179	+ 58	35	12.6	19.85
$\gamma$ Pegasi ( <i>Algenib</i> ) . . . . .	3	0	7	58.96	3.085	+ 14	36	59.2	20.02
$\epsilon$ Ceti . . . . .	3	0	14	13.65	3.053	- 9	23	22.9	19.95
$\beta$ Hydri . . . . .	3	0	20	23.34	3.218	- 77	49	43.5	20.28
$\alpha$ Cassiopeiæ . . . . . ( <i>var.</i> )	2	0	34	43.06	+ 3.379	+ 55	58	40.3	+ 19.78
$\beta$ Ceti . . . . .	2	0	38	28.20	3.014	- 18	32	47.7	19.80
$\gamma$ Cassiopeiæ . . . . .	2	0	50	32.94	3.585	+ 60	9	51.4	19.55
$\beta$ Andromedæ . . . . .	2	1	4	1.19	3.347	+ 35	4	47.0	19.15
$\theta$ Ceti . . . . .	4	1	18	55.47	2.997	- 8	42	34.9	18.66
$\alpha$ Ursæ Min. ( <i>Polaris</i> ) . . . . .	2	1	21	43.70	+24.832	+ 88	45	49.1	+ 18.79
$\alpha$ Eridani ( <i>Achernar</i> ) . . . . .	1	1	33	54.55	2.231	- 57	45	18.0	18.34
$\zeta$ Ceti . . . . .	4	1	46	25.54	2.962	- 10	50	24.4	17.80
$\beta$ Arietis . . . . .	3	1	49	0.22	3.305	+ 20	18	33.8	17.71
$\gamma$ Andromedæ . . . . .	2	1	57	38.14	3.664	+ 41	50	24.8	17.42
$\alpha$ Arietis . . . . .	2	2	1	25.32	+ 3.373	+ 22	58	48.3	+ 17.15
$\beta$ Trianguli . . . . .	3	2	3	28.38	3.557	+ 34	30	17.4	17.18
$\epsilon$ Cassiopeiæ . . . . .	4	2	20	39.10	4.873	+ 66	56	37.5	16.40
$\gamma$ Ceti . . . . .	3	2	38	0.86	3.104	+ 2	48	21.2	15.31
$\alpha$ Ceti . . . . .	2	2	56	56.79	3.131	+ 3	41	22.2	14.28
$\beta$ Persei ( <i>Algol</i> ) . . . . . ( <i>var.</i> )	2	3	1	31.78	+ 3.887	+ 40	33	45.1	+ 14.09
$\alpha$ Persei . . . . .	2	3	17	2.34	4.262	+ 49	29	52.9	13.05
$\epsilon$ Eridani . . . . .	4	3	28	7.45	2.824	- 9	48	12.0	12.37
$\eta$ Tauri . . . . .	3	3	41	25.17	3.558	+ 23	47	22.6	11.34
$\zeta$ Persei . . . . .	3	3	47	43.14	+ 3.762	+ 31	34	49.7	10.91
$\gamma$ Hydri . . . . .	3	3	48	48.82	- 0.987	- 74	33	5.4	+ 10.99
$\gamma$ Eridani . . . . .	3	3	53	16.26	+ 2.799	- 13	47	55.5	10.42
$\epsilon$ Persei . . . . .	4	4	1	15.28	4.340	+ 47	26	24.1	9.89
$\epsilon$ Tauri . . . . .	4	4	22	39.57	3.498	+ 18	57	14.7	8.22
$\alpha$ Tauri ( <i>Aldebaran</i> ) . . . . .	1	4	30	4.02	3.438	+ 16	18	15.0	7.48
$\epsilon$ Aurigæ . . . . .	3	4	50	21.03	+ 3.902	+ 33	0	16.2	+ 5.98
$\beta$ Eridani . . . . .	3	5	2	50.10	2.949	- 5	13	5.8	4.89
$\alpha$ Aurigæ ( <i>Capella</i> ) . . . . .	1	5	9	9.19	4.426	+ 45	53	38.7	3.98
$\beta$ Orionis ( <i>Rigel</i> ) . . . . .	1	5	9	38.13	2.882	- 8	19	10.5	4.36
$\beta$ Tauri . . . . .	2	5	19	50.61	3.790	+ 28	31	16.2	3.32
$\delta$ Orionis . . . . . ( <i>var.</i> )	2	5	26	47.72	+ 3.064	- 0	22	29.1	+ 2.89
$\alpha$ Leporis . . . . .	3	5	28	13.88	2.645	- 17	53	43.3	2.77
$\epsilon$ Orionis . . . . .	2	5	31	2.23	3.043	- 1	16	1.6	2.53
$\alpha$ Columbæ . . . . .	3	5	35	57.40	2.173	- 34	7	43.1	2.06
$\alpha$ Orionis . . . . .	2	5	42	55.10	2.845	- 9	42	21.4	1.50
$\alpha$ Orionis . . . . . ( <i>var.</i> )	1	5	49	38.96	+ 3.247	+ 7	23	16.6	+ 0.91
$\beta$ Aurigæ . . . . .	2	5	52	2.83	4.402	+ 44	56	12.7	0.68
$\theta$ Aurigæ . . . . .	3	5	52	45.99	4.092	+ 37	12	19.2	+ 0.54
$\eta$ Geminorum . . . . .	3	6	8	43.28	3.623	+ 22	32	10.7	- 0.78
$\mu$ Geminorum . . . . .	3	6	16	47.42	3.631	+ 22	33	56.8	1.59
$\alpha$ Argûs ( <i>Canopus</i> ) . . . . .	1	6	21	41.33	+ 1.330	- 52	38	23.7	- 1.89
$\gamma$ Geminorum . . . . .	2	6	31	49.18	3.467	+ 16	29	10.5	2.82
$\alpha$ Canis Majoris ( <i>Sirius</i> ) . . . . .	1	6	40	39.21	2.644	- 16	34	34.6	4.74
$\epsilon$ Canis Majoris . . . . .	2	6	54	37.05	2.358	- 28	50	0.4	4.75
$\delta$ Canis Majoris . . . . .	2	7	4	14.62	+ 2.439	- 26	13	52.3	- 5.54

## MEAN PLACES FOR THE BEGINNING OF 1898.

Name of Star.	Magni- tude.	Right Ascension.	Annual Variation.	Declination.	Annual Variation.
		h m s	s	° ' "	"
$\delta$ Geminorum . . . .	3	7 14 1.92	+ 3.587	+ 22 10 12.1	- 6.38
$\beta$ Canis Minoris . . . .	3	7 21 37.23	3.259	+ 8 29 41.0	7.03
$\alpha^2$ Geminorum ( <i>Castor</i> ) . . . .	2	7 28 5.63	3.837	+ 32 6 44.5	7.60
$\alpha$ Canis Minoris ( <i>Procyon</i> ) . . . .	1	7 33 57.77	3.143	+ 5 29 10.7	9.03
$\beta$ Geminorum ( <i>Pollux</i> ) . . . .	1	7 39 4.53	3.678	+ 28 16 20.9	8.46
15 Argûs . . . . .	3	8 3 12.00	+ 2.554	- 24 0 37.0	- 10.22
30 Monocerotis . . . . .	4	8 20 33.82	3.000	- 3 34 24.9	11.54
$\epsilon$ Hydræ . . . . .	3	8 41 22.52	3.181	+ 6 47 34.7	13.03
$\epsilon$ Ursæ Majoris . . . . .	3	8 52 13.52	4.130	+ 48 26 31.4	13.94
$\beta$ Argûs . . . . .	2	9 12 4.82	0.675	- 69 17 49.3	14.81
$\epsilon$ Argûs . . . . .	2	9 14 21.38	+ 1.601	- 58 50 48.6	- 15.01
$\alpha$ Hydræ . . . . .	2	9 22 34.52	2.949	- 8 12 59.5	15.47
$\theta$ Ursæ Majoris . . . . .	3	9 26 2.11	4.036	+ 52 8 31.4	16.25
$\epsilon$ Leonis . . . . .	3	9 40 3.75	3.414	+ 24 14 37.8	16.45
$\alpha$ Leonis ( <i>Regulus</i> ) . . . . .	1	10 2 56.43	3.200	+ 12 27 56.5	17.49
$\gamma^1$ Leonis . . . . .	2	10 14 20.98	+ 3.314	+ 20 21 27.0	- 18.10
$\rho$ Leonis . . . . .	4	10 27 26.49	3.164	+ 9 49 53.0	18.45
46 Leonis Minoris . . . . .	4	10 47 36.51	3.367	+ 34 45 54.1	19.31
$\alpha$ Ursæ Majoris . . . . .	2	10 57 26.09	3.741	+ 62 18 6.0	19.38
$\delta$ Leonis . . . . .	3	11 8 41.08	3.197	+ 21 4 56.9	19.69
$\delta$ Crateris . . . . .	4	11 14 14.47	+ 2.997	- 14 13 36.3	- 19.47
$\lambda$ Draconis . . . . .	4	11 25 20.93	3.612	+ 69 53 38.4	19.84
$\beta$ Leonis . . . . .	2	11 43 51.44	3.063	+ 15 8 31.9	20.12
$\gamma$ Ursæ Majoris . . . . .	2	11 48 28.10	3.178	+ 54 15 42.2	20.03
$\epsilon$ Corvi . . . . .	3	12 4 52.70	3.084	- 22 3 9.0	20.05
$\gamma$ Corvi . . . . .	3	12 10 33.61	+ 3.081	- 16 58 32.3	- 20.02
$\eta$ Virginis . . . . .	4	12 14 41.25	3.069	- 0 6 0.2	20.04
$\alpha^1$ Crucis . . . . .	1	12 20 55.41	3.301	- 62 32 1.8	20.01
$\delta^3$ Corvi . . . . .	3	12 24 35.31	3.104	- 15 56 50.7	20.08
$\beta$ Corvi . . . . .	3	12 29 1.69	3.143	- 22 49 58.0	19.96
$\gamma$ Virginis . . . . .	3	12 36 29.52	+ 3.039	- 0 53 24.9	- 19.80
$\alpha$ Canum Venaticorum . . . . .	3	12 51 15.48	2.814	+ 38 52 8.8	19.50
$\epsilon$ Virginis . . . . .	3	12 57 6.01	2.988	+ 11 30 26.3	19.41
$\alpha$ Virginis ( <i>Spica</i> ) . . . . .	1	13 19 49.10	3.155	- 10 37 44.5	18.89
$\zeta$ Virginis . . . . .	3	13 29 29.70	3.054	- 0 4 28.0	18.50
$\eta$ Ursæ Majoris . . . . .	2	13 43 31.38	+ 2.370	+ 49 49 19.9	- 18.07
$\eta$ Bootis . . . . .	3	13 49 49.69	2.857	+ 18 54 32.3	18.15
$\beta$ Centauri . . . . .	1	13 56 37.10	4.185	- 59 52 51.9	17.56
$\alpha$ Draconis . . . . .	4	14 1 37.72	1.624	+ 64 51 47.4	17.29
$\alpha$ Bootis ( <i>Arcturus</i> ) . . . . .	1	14 11 0.53	2.735	+ 19 42 48.1	18.86
$\alpha$ Centauri ( <i>mean</i> ) . . . . .	1	14 32 40.17	+ 4.041	- 60 24 51.8	- 15.03
$\epsilon$ Bootis . . . . .	2	14 40 32.01	2.621	+ 27 30 14.8	15.32
$\alpha^2$ Libræ . . . . .	3	14 45 14.04	+ 3.311	- 15 37 4.8	15.14
$\beta$ Ursæ Minoris . . . . .	2	14 51 0.02	- 0.222	+ 74 34 20.3	14.72
$\beta$ Bootis . . . . .	4	14 58 6.26	+ 2.260	+ 40 47 33.8	14.34
$\delta$ Bootis . . . . .	3	15 11 23.49	+ 2.421	+ 33 41 43.6	- 13.56
$\beta$ Libræ . . . . .	3	15 11 31.03	+ 3.223	- 9 0 24.0	13.48
$\gamma^2$ Ursæ Minoris . . . . .	3	15 20 53.37	- 0.127	+ 72 11 49.0	12.81
$\alpha$ Coronæ Borealis . . . . .	2	15 30 22.17	+ 2.540	+ 27 3 28.3	12.28
$\alpha$ Serpentis . . . . .	3	15 39 14.60	+ 2.952	+ 6 44 46.9	- 11.52

## MEAN PLACES FOR THE BEGINNING OF 1898.

Name of Star.	Magni- tude.	Right Ascension.	Annual Variation.	Declination.	Annual Variation.
		h m s	s	° ' "	"
ε Serpentis . . . . .	4	15 45 43.87	+ 2.988	+ 4 47 5.2	- 11.02
δ Scorpii . . . . .	2	15 54 18.08	3.540	- 22 19 53.1	10.49
β <sup>1</sup> Scorpii . . . . .	3	15 59 30.32	3.482	- 19 31 34.9	10.10
δ Ophiuchi . . . . .	3	16 8 59.98	3.140	- 3 25 54.1	9.48
τ Herculis . . . . .	4	16 16 40.50	1.802	+ 46 33 21.7	8.72
η Draconis . . . . .	3	16 22 36.71	+ 0.808	+ 61 44 41.9	- 8.21
α Scorpii ( <i>Antares</i> ) . . . . .	1	16 23 9.13	3.672	- 26 12 20.5	8.26
β Herculis . . . . .	3	16 25 50.10	2.578	+ 21 42 42.7	8.03
ζ Ophiuchi . . . . .	3	16 31 32.50	3.300	- 10 21 37.9	7.53
α Trianguli Australis . . . . .	2	16 37 51.84	6.311	- 68 50 24.6	7.08
κ Ophiuchi . . . . .	3	16 52 50.41	+ 2.838	+ 9 32 1.0	- 5.80
η Ophiuchi . . . . .	2	17 4 31.63	3.436	- 15 35 55.4	4.73
π Herculis . . . . .	3	17 11 29.69	2.089	+ 36 55 26.6	4.20
θ Ophiuchi . . . . .	3	17 15 44.66	3.680	- 24 53 52.4	3.90
β Draconis . . . . .	3	17 28 7.70	1.354	+ 52 22 36.1	2.78
α Ophiuchi . . . . .	2	17 30 11.96	+ 2.783	+ 12 38 3.1	- 2.84
μ Herculis . . . . .	3	17 42 28.01	2.347	+ 27 46 48.6	2.29
γ Draconis . . . . .	2	17 54 14.25	1.392	+ 51 30 2.6	- 0.53
η Serpentis . . . . .	3	18 16 1.90	3.102	- 2 55 30.0	+ 0.73
λ Sagittarii . . . . .	3	18 21 40.54	3.702	- 25 28 42.0	1.67
α Lyræ ( <i>Vega</i> ) . . . . .	1	18 33 29.12	+ 2.031	+ 38 41 18.8	+ 3.19
σ Sagittarii . . . . .	2	18 48 56.44	3.721	- 26 25 24.5	4.17
ζ Aquilæ . . . . .	3	19 0 43.32	2.757	+ 13 42 42.4	5.15
δ Draconis . . . . .	3	19 12 31.97	0.028	+ 67 28 55.6	6.33
β Cygni . . . . .	3	19 26 36.48	2.420	+ 27 44 43.2	7.39
γ Aquilæ . . . . .	3	19 41 24.63	+ 2.852	+ 10 21 52.6	+ 8.58
δ Cygni . . . . .	3	19 41 47.26	1.876	+ 44 52 53.9	8.65
α Aquilæ ( <i>Altair</i> ) . . . . .	1	19 45 48.41	2.927	+ 8 35 55.7	9.30
θ Aquilæ . . . . .	3	20 6 2.50	3.097	- 1 7 26.9	10.49
α <sup>2</sup> Capricorni . . . . .	4	20 12 23.74	3.331	- 12 51 39.6	10.95
α Pavonis . . . . .	2	20 17 35.23	+ 4.779	- 57 3 42.2	+ 11.24
γ Cygni . . . . .	2	20 18 34.17	2.154	+ 39 55 48.2	11.39
β Pavonis . . . . .	3	20 35 46.20	5.464	- 66 34 10.2	12.58
α Cygni . . . . .	1	20 37 57.29	2.045	+ 44 54 56.5	12.74
ε Cygni . . . . .	3	20 42 5.06	2.428	+ 33 35 16.9	13.36
ν Cygni . . . . .	4	20 53 22.21	+ 2.234	+ 40 46 27.7	+ 13.74
ζ Cygni . . . . .	3	21 8 35.64	2.550	+ 29 48 30.1	14.63
α Cephei . . . . .	3	21 16 8.75	1.436	+ 62 9 11.9	15.18
β Aquarii . . . . .	3	21 26 11.39	3.161	- 6 1 12.0	15.69
β Cephei . . . . .	3	21 27 20.64	0.791	+ 70 6 46.2	15.76
ε Pegasi . . . . .	2	21 39 10.60	+ 2.947	+ 9 24 26.2	+ 16.38
α Aquarii . . . . .	3	22 0 32.71	3.082	- 0 48 55.6	17.38
α Gruis . . . . .	2	22 1 48.32	3.802	- 47 27 17.6	17.27
γ Aquarii . . . . .	4	22 16 23.27	3.100	- 1 54 5.0	18.06
ζ Pegasi . . . . .	3	22 36 22.50	2.991	+ 10 17 55.9	18.72
ι Cephei . . . . .	3	22 46 2.78	+ 2.124	+ 65 39 49.7	+ 18.88
α Pis. Aust. ( <i>Fomalhaut</i> ) . . . . .	1	22 52 0.87	3.323	- 30 9 46.3	19.00
α Pegasi ( <i>Markab</i> ) . . . . .	2	22 59 40.78	2.986	+ 14 39 22.9	19.31
λ Andromedæ . . . . .	4	23 32 34.25	2.924	+ 45 54 18.8	19.48
ω Piscium . . . . .	4	23 54 4.40	+ 3.079	+ 6 17 54.9	+ 19.93

TABLE FOR FINDING THE LATITUDE BY AN OBSERVED ALTITUDE OF POLARIS.

Reduce the observed altitude of Polaris to the true altitude.

Reduce the recorded time of observation to the local sidereal time.

If the sidereal time is  $\left\{ \begin{array}{l} \text{less than } 1^{\text{h}} 21^{\text{m}}.8, \text{ subtract it from } 1^{\text{h}} 21^{\text{m}}.8; \\ \text{between } 1^{\text{h}} 21^{\text{m}}.8 \text{ and } 13^{\text{h}} 21^{\text{m}}.8, \text{ subtract } 1^{\text{h}} 21^{\text{m}}.8 \text{ from it;} \\ \text{greater than } 13^{\text{h}} 21^{\text{m}}.8, \text{ subtract it from } 25^{\text{h}} 21^{\text{m}}.8; \end{array} \right.$

and the remainder is the hour-angle of Polaris.

With this hour-angle take out the correction from Table I (below), and add it to or subtract it from the true altitude, according to its sign. The result is the approximate latitude of the place.

*Example.*—1898, October 1, at  $10^{\text{h}} 40^{\text{m}} 30^{\text{s}}$ , P. M., mean solar time, in longitude  $29^{\circ}$  east of Greenwich, suppose the true altitude of Polaris to be  $43^{\circ} 20'$ : required the latitude of the place.

Local astronomical mean time	h	m	s
Reduction from Table II, for $10^{\text{h}} 40^{\text{m}} 30^{\text{s}}$	10	40	30
Greenwich sidereal time of mean noon, October 1, page 25	+	1	45
Reduction from Table II, for longitude ( $= 1^{\text{h}} 56^{\text{m}}$ east, or minus)	12	40	58
	—	0	19
Sum (having regard to signs) is equal to local sidereal time	23	22	54
	h	m	s
Subtract sidereal time	25	21	48
Remainder is equal to hour-angle of Polaris	23	22	54
	1	58	54
True altitude	+	43	20
Correction from Table I (below)	—	1	4
Approximate Latitude	+	42	16

TABLE I—1898.

Hour-Angle.	0 <sup>h</sup> .	1 <sup>h</sup> .	2 <sup>h</sup> .	3 <sup>h</sup> .	4 <sup>h</sup> .	5 <sup>h</sup> .
m						
0	— 0 13.9	— 0 11.3	— 0 3.8	— 0 51.9	— 0 36.4	— 0 18.4
5	1 13.9 0.0	1 10.9 0.4	1 3.0 0.8	0 50.7 1.2	0 35.0 1.4	0 16.9 1.5
10	1 13.8 0.1	1 10.4 0.5	1 2.1 0.9	0 49.5 1.2	0 33.6 1.4	0 15.3 1.6
15	1 13.7 0.1	1 9.9 0.5	1 1.2 0.9	0 48.3 1.2	0 32.1 1.5	0 13.7 1.6
20	— 1 13.6 0.1	— 1 9.4 0.6	— 1 0.3 1.0	— 0 47.1 1.3	— 0 30.6 1.5	— 0 12.1 1.6
25	1 13.5 0.2	1 8.8 0.6	0 59.3 1.0	0 45.8 1.3	0 29.1 1.5	0 10.5 1.6
30	1 13.3 0.2	1 8.2 0.7	0 58.3 1.0	0 44.5 1.3	0 27.6 1.5	0 8.9 1.6
35	1 13.1 0.3	1 7.5 0.7	0 57.3 1.0	0 43.2 1.3	0 26.1 1.5	0 7.3 1.6
40	— 1 12.8 0.3	— 1 6.8 0.7	0 56.3 1.1	— 0 41.9 1.4	— 0 24.6 1.5	— 0 5.7 1.6
45	1 12.5 0.4	1 6.1 0.7	0 55.2 1.1	0 40.5 1.4	0 23.1 1.5	0 4.1 1.6
50	1 12.1 0.4	1 5.4 0.8	0 54.1 1.1	0 39.2 1.4	0 21.6 1.6	0 2.5 1.6
55	1 11.7 0.4	1 4.6 0.8	0 53.0 1.1	0 37.8 1.4	0 20.0 1.6	— 0 0.9 1.7
60	— 1 11.3 0.4	— 1 3.8 0.8	— 0 51.9 1.1	— 0 36.4 1.4	— 0 18.4 1.6	+ 0 0.8 1.7
Hour-Angle.	6 <sup>h</sup> .	7 <sup>h</sup> .	8 <sup>h</sup> .	9 <sup>h</sup> .	10 <sup>h</sup> .	11 <sup>h</sup> .
m						
0	+ 0 0.8	+ 0 19.8	+ 0 37.6	+ 0 52.6	+ 0 4.2	+ 0 11.4
5	0 2.4 1.6	0 21.4 1.5	0 39.0 1.4	0 53.7 1.1	1 5.0 0.8	1 11.8 0.4
10	0 4.0 1.6	0 22.9 1.6	0 40.3 1.3	0 54.8 1.1	1 5.7 0.7	1 12.2 0.3
15	0 5.6 1.6	0 24.5 1.5	0 41.6 1.3	0 55.9 1.0	1 6.4 0.7	1 12.5 0.3
20	+ 0 7.2 1.6	+ 0 26.0 1.5	+ 0 42.9 1.3	+ 0 56.9 1.0	+ 1 7.1 0.7	+ 1 12.8 0.3
25	0 8.8 1.6	0 27.5 1.5	0 44.2 1.3	0 57.9 1.0	1 7.8 0.6	1 13.1 0.2
30	0 10.4 1.6	0 29.0 1.5	0 45.5 1.3	0 58.9 1.0	1 8.4 0.5	1 13.3 0.2
35	0 12.0 1.6	0 30.5 1.4	0 46.8 1.2	0 59.9 0.9	1 8.9 0.5	1 13.5 0.1
40	+ 0 13.6 1.6	+ 0 31.9 1.4	+ 0 48.0 1.2	+ 1 0.8 0.9	+ 1 9.4 0.5	+ 1 13.6 0.1
45	0 15.2 1.6	0 33.3 1.5	0 49.2 1.2	1 1.7 0.9	1 9.9 0.5	1 13.7 0.1
50	0 16.8 1.5	0 34.8 1.4	0 50.4 1.1	1 2.6 0.8	1 10.4 0.5	1 13.8 0.1
55	0 18.3 1.5	0 36.2 1.4	0 51.5 1.1	1 3.4 0.8	1 10.9 0.5	1 13.9 0.0
60	+ 0 19.8 1.5	+ 0 37.6 1.4	+ 0 52.6 1.1	+ 1 4.2 0.8	+ 1 11.4 0.5	+ 1 13.9 0.0

34 TABLE II.—MEAN SOLAR INTO SIDEREAL TIME.

TO BE ADDED TO A MEAN TIME INTERVAL.												
Mean Solar.	0 <sup>h</sup> .	1 <sup>h</sup> .	2 <sup>h</sup> .	3 <sup>h</sup> .	4 <sup>h</sup> .	5 <sup>h</sup> .	6 <sup>h</sup> .	7 <sup>h</sup> .	8 <sup>h</sup> .	9 <sup>h</sup> .	10 <sup>h</sup> .	11 <sup>h</sup> .
m	m	s	m	s	m	s	m	s	m	s	m	s
0	0	0.0	0	9.9	0	19.7	0	29.6	0	39.4	0	49.3
1	0	0.2	0	10.0	0	19.9	0	29.7	0	39.6	0	49.4
2	0	0.3	0	10.2	0	20.0	0	29.9	0	39.8	0	49.6
3	0	0.5	0	10.3	0	20.2	0	30.1	0	39.9	0	49.8
4	0	0.7	0	10.5	0	20.4	0	30.2	0	40.1	0	49.9
5	0	0.8	0	10.7	0	20.5	0	30.4	0	40.2	0	50.1
6	0	1.0	0	10.8	0	20.7	0	30.6	0	40.4	0	50.3
7	0	1.2	0	11.0	0	20.9	0	30.7	0	40.6	0	50.4
8	0	1.3	0	11.2	0	21.0	0	30.9	0	40.7	0	50.6
9	0	1.5	0	11.3	0	21.2	0	31.0	0	40.9	0	50.8
10	0	1.6	0	11.5	0	21.4	0	31.2	0	41.1	0	50.9
11	0	1.8	0	11.7	0	21.5	0	31.4	0	41.2	0	51.1
12	0	2.0	0	11.8	0	21.7	0	31.5	0	41.4	0	51.3
13	0	2.1	0	12.0	0	21.8	0	31.7	0	41.6	0	51.4
14	0	2.3	0	12.2	0	22.0	0	31.9	0	41.7	0	51.6
15	0	2.5	0	12.3	0	22.2	0	32.0	0	41.9	0	51.7
16	0	2.6	0	12.5	0	22.3	0	32.2	0	42.1	0	51.9
17	0	2.8	0	12.6	0	22.5	0	32.4	0	42.2	0	52.1
18	0	3.0	0	12.8	0	22.7	0	32.5	0	42.4	0	52.2
19	0	3.1	0	13.0	0	22.8	0	32.7	0	42.5	0	52.4
20	0	3.3	0	13.1	0	23.0	0	32.9	0	42.7	0	52.6
21	0	3.4	0	13.3	0	23.2	0	33.0	0	42.9	0	52.7
22	0	3.6	0	13.5	0	23.3	0	33.2	0	43.0	0	52.9
23	0	3.8	0	13.6	0	23.5	0	33.3	0	43.2	0	53.1
24	0	3.9	0	13.8	0	23.7	0	33.5	0	43.4	0	53.2
25	0	4.1	0	14.0	0	23.8	0	33.7	0	43.5	0	53.4
26	0	4.3	0	14.1	0	24.0	0	33.8	0	43.7	0	53.6
27	0	4.4	0	14.3	0	24.1	0	34.0	0	43.9	0	53.7
28	0	4.6	0	14.5	0	24.3	0	34.2	0	44.0	0	53.9
29	0	4.8	0	14.6	0	24.5	0	34.3	0	44.2	0	54.0
30	0	4.9	0	14.8	0	24.6	0	34.5	0	44.4	0	54.2
31	0	5.1	0	14.9	0	24.8	0	34.7	0	44.5	0	54.4
32	0	5.3	0	15.1	0	25.0	0	34.8	0	44.7	0	54.5
33	0	5.4	0	15.3	0	25.1	0	35.0	0	44.8	0	54.7
34	0	5.6	0	15.4	0	25.3	0	35.2	0	45.0	0	54.9
35	0	5.8	0	15.6	0	25.5	0	35.3	0	45.2	0	55.0
36	0	5.9	0	15.8	0	25.6	0	35.5	0	45.3	0	55.2
37	0	6.1	0	15.9	0	25.8	0	35.6	0	45.5	0	55.4
38	0	6.2	0	16.1	0	26.0	0	35.8	0	45.7	0	55.5
39	0	6.4	0	16.3	0	26.1	0	36.0	0	45.8	0	55.7
40	0	6.6	0	16.4	0	26.3	0	36.1	0	46.0	0	55.9
41	0	6.7	0	16.6	0	26.4	0	36.3	0	46.2	0	56.0
42	0	6.9	0	16.8	0	26.6	0	36.5	0	46.3	0	56.2
43	0	7.1	0	16.9	0	26.8	0	36.6	0	46.5	0	56.3
44	0	7.2	0	17.1	0	26.9	0	36.8	0	46.7	0	56.5
45	0	7.4	0	17.2	0	27.1	0	37.0	0	46.8	0	56.7
46	0	7.6	0	17.4	0	27.3	0	37.1	0	47.0	0	56.8
47	0	7.7	0	17.6	0	27.4	0	37.3	0	47.1	0	57.0
48	0	7.9	0	17.7	0	27.6	0	37.5	0	47.3	0	57.2
49	0	8.0	0	17.9	0	27.8	0	37.6	0	47.5	0	57.3
50	0	8.2	0	18.1	0	27.9	0	37.8	0	47.6	0	57.5
51	0	8.4	0	18.2	0	28.1	0	37.9	0	47.8	0	57.7
52	0	8.5	0	18.4	0	28.3	0	38.1	0	48.0	0	57.8
53	0	8.7	0	18.6	0	28.4	0	38.3	0	48.1	0	58.0
54	0	8.9	0	18.7	0	28.6	0	38.4	0	48.3	0	58.2
55	0	9.0	0	18.9	0	28.7	0	38.6	0	48.5	0	58.3
56	0	9.2	0	19.1	0	28.9	0	38.8	0	48.6	0	58.5
57	0	9.4	0	19.2	0	29.1	0	38.9	0	48.8	0	58.6
58	0	9.5	0	19.4	0	29.2	0	39.1	0	49.0	0	58.8
59	0	9.7	0	19.5	0	29.4	0	39.3	0	49.1	0	59.0
Mean Solar.	0 <sup>h</sup> .	1 <sup>h</sup> .	2 <sup>h</sup> .	3 <sup>h</sup> .	4 <sup>h</sup> .	5 <sup>h</sup> .	6 <sup>h</sup> .	7 <sup>h</sup> .	8 <sup>h</sup> .	9 <sup>h</sup> .	10 <sup>h</sup> .	11 <sup>h</sup> .

TABLE II.—MEAN SOLAR INTO SIDEREAL TIME. 35

TO BE ADDED TO A MEAN TIME INTERVAL.												
Mean Solar.	12 <sup>h</sup> .	13 <sup>h</sup> .	14 <sup>h</sup> .	15 <sup>h</sup> .	16 <sup>h</sup> .	17 <sup>h</sup> .	18 <sup>h</sup> .	19 <sup>h</sup> .	20 <sup>h</sup> .	21 <sup>h</sup> .	22 <sup>h</sup> .	23 <sup>h</sup> .
m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s
0	1 58.3	2 8.1	2 18.0	2 27.8	2 37.7	2 47.6	2 57.4	3 7.3	3 17.1	3 27.0	3 36.8	3 46.7
1	1 58.4	2 8.3	2 18.2	2 28.0	2 37.9	2 47.7	2 57.6	3 7.4	3 17.3	3 27.2	3 37.0	3 46.9
2	1 58.6	2 8.5	2 18.3	2 28.2	2 38.0	2 47.9	2 57.7	3 7.6	3 17.5	3 27.3	3 37.2	3 47.0
3	1 58.8	2 8.6	2 18.5	2 28.3	2 38.2	2 48.1	2 57.9	3 7.8	3 17.6	3 27.5	3 37.3	3 47.2
4	1 58.9	2 8.8	2 18.6	2 28.5	2 38.4	2 48.2	2 58.1	3 7.9	3 17.8	3 27.6	3 37.5	3 47.4
5	1 59.1	2 9.0	2 18.8	2 28.7	2 38.5	2 48.4	2 58.2	3 8.1	3 18.0	3 27.8	3 37.7	3 47.5
6	1 59.3	2 9.1	2 19.0	2 28.8	2 38.7	2 48.5	2 58.4	3 8.3	3 18.1	3 28.0	3 37.8	3 47.7
7	1 59.4	2 9.3	2 19.1	2 29.0	2 38.9	2 48.7	2 58.6	3 8.4	3 18.3	3 28.1	3 38.0	3 47.8
8	1 59.6	2 9.4	2 19.3	2 29.2	2 39.0	2 48.9	2 58.7	3 8.6	3 18.4	3 28.3	3 38.2	3 48.0
9	1 59.8	2 9.6	2 19.5	2 29.3	2 39.2	2 49.0	2 58.9	3 8.8	3 18.6	3 28.5	3 38.3	3 48.2
10	1 59.9	2 9.8	2 19.6	2 29.5	2 39.3	2 49.2	2 59.1	3 8.9	3 18.8	3 28.6	3 38.5	3 48.3
11	2 0.1	2 9.9	2 19.8	2 29.7	2 39.5	2 49.4	2 59.2	3 9.1	3 18.9	3 28.8	3 38.6	3 48.5
12	2 0.2	2 10.1	2 20.0	2 29.8	2 39.7	2 49.5	2 59.4	3 9.2	3 19.1	3 29.0	3 38.8	3 48.7
13	2 0.4	2 10.3	2 20.1	2 30.0	2 39.8	2 49.7	2 59.6	3 9.4	3 19.3	3 29.1	3 39.0	3 48.8
14	2 0.6	2 10.4	2 20.3	2 30.1	2 40.0	2 49.9	2 59.7	3 9.6	3 19.4	3 29.3	3 39.1	3 49.0
15	2 0.7	2 10.6	2 20.5	2 30.3	2 40.2	2 50.0	2 59.9	3 9.7	3 19.6	3 29.4	3 39.3	3 49.2
16	2 0.9	2 10.8	2 20.6	2 30.5	2 40.3	2 50.2	3 0.0	3 9.9	3 19.8	3 29.6	3 39.5	3 49.3
17	2 1.1	2 10.9	2 20.8	2 30.6	2 40.5	2 50.4	3 0.2	3 10.1	3 19.9	3 29.8	3 39.6	3 49.5
18	2 1.2	2 11.1	2 20.9	2 30.8	2 40.7	2 50.5	3 0.4	3 10.2	3 20.1	3 29.9	3 39.8	3 49.7
19	2 1.4	2 11.3	2 21.1	2 31.0	2 40.8	2 50.7	3 0.5	3 10.4	3 20.3	3 30.1	3 40.0	3 49.8
20	2 1.6	2 11.4	2 21.3	2 31.1	2 41.0	2 50.8	3 0.7	3 10.6	3 20.4	3 30.3	3 40.1	3 50.0
21	2 1.7	2 11.6	2 21.4	2 31.3	2 41.2	2 51.0	3 0.9	3 10.7	3 20.6	3 30.4	3 40.3	3 50.1
22	2 1.9	2 11.7	2 21.6	2 31.5	2 41.3	2 51.2	3 1.0	3 10.9	3 20.7	3 30.6	3 40.5	3 50.3
23	2 2.1	2 11.9	2 21.8	2 31.6	2 41.5	2 51.3	3 1.2	3 11.1	3 20.9	3 30.8	3 40.6	3 50.5
24	2 2.2	2 12.1	2 21.9	2 31.8	2 41.6	2 51.5	3 1.4	3 11.2	3 21.1	3 30.9	3 40.8	3 50.6
25	2 2.4	2 12.2	2 22.1	2 32.0	2 41.8	2 51.7	3 1.5	3 11.4	3 21.2	3 31.1	3 40.9	3 50.8
26	2 2.5	2 12.4	2 22.3	2 32.1	2 42.0	2 51.8	3 1.7	3 11.5	3 21.4	3 31.3	3 41.1	3 51.0
27	2 2.7	2 12.6	2 22.4	2 32.3	2 42.1	2 52.0	3 1.9	3 11.7	3 21.6	3 31.4	3 41.3	3 51.1
28	2 2.9	2 12.7	2 22.6	2 32.4	2 42.3	2 52.2	3 2.0	3 11.9	3 21.7	3 31.6	3 41.4	3 51.3
29	2 3.0	2 12.9	2 22.8	2 32.6	2 42.5	2 52.3	3 2.2	3 12.0	3 21.9	3 31.8	3 41.6	3 51.5
30	2 3.2	2 13.1	2 22.9	2 32.8	2 42.6	2 52.5	3 2.3	3 12.2	3 22.1	3 31.9	3 41.8	3 51.6
31	2 3.4	2 13.2	2 23.1	2 32.9	2 42.8	2 52.7	3 2.5	3 12.4	3 22.2	3 32.1	3 41.9	3 51.8
32	2 3.5	2 13.4	2 23.2	2 33.1	2 43.0	2 52.8	3 2.7	3 12.5	3 22.4	3 32.2	3 42.1	3 52.0
33	2 3.7	2 13.6	2 23.4	2 33.3	2 43.1	2 53.0	3 2.8	3 12.7	3 22.6	3 32.4	3 42.3	3 52.1
34	2 3.9	2 13.7	2 23.6	2 33.4	2 43.3	2 53.1	3 3.0	3 12.9	3 22.7	3 32.6	3 42.4	3 52.3
35	2 4.0	2 13.9	2 23.7	2 33.6	2 43.5	2 53.3	3 3.2	3 13.0	3 22.9	3 32.7	3 42.6	3 52.4
36	2 4.2	2 14.0	2 23.9	2 33.8	2 43.6	2 53.5	3 3.3	3 13.2	3 23.0	3 32.9	3 42.8	3 52.6
37	2 4.4	2 14.2	2 24.1	2 33.9	2 43.8	2 53.6	3 3.5	3 13.4	3 23.2	3 33.1	3 42.9	3 52.8
38	2 4.5	2 14.4	2 24.2	2 34.1	2 43.9	2 53.8	3 3.7	3 13.5	3 23.1	3 33.2	3 43.1	3 52.9
39	2 4.7	2 14.5	2 24.4	2 34.3	2 44.1	2 54.0	3 3.8	3 13.7	3 23.5	3 33.4	3 43.2	3 53.1
40	2 4.8	2 14.7	2 24.6	2 34.4	2 44.3	2 54.1	3 4.0	3 13.8	3 23.7	3 33.6	3 43.4	3 53.3
41	2 5.0	2 14.9	2 24.7	2 34.6	2 44.4	2 54.3	3 4.2	3 14.0	3 23.9	3 33.7	3 43.6	3 53.4
42	2 5.2	2 15.0	2 24.9	2 34.7	2 44.6	2 54.5	3 4.3	3 14.2	3 24.0	3 33.9	3 43.7	3 53.6
43	2 5.3	2 15.2	2 25.1	2 34.9	2 44.8	2 54.6	3 4.5	3 14.3	3 24.2	3 34.0	3 43.9	3 53.8
44	2 5.5	2 15.4	2 25.2	2 35.1	2 44.9	2 54.8	3 4.6	3 14.5	3 24.4	3 34.2	3 44.1	3 53.9
45	2 5.7	2 15.5	2 25.4	2 35.2	2 45.1	2 55.0	3 4.8	3 14.7	3 24.5	3 34.4	3 44.2	3 54.1
46	2 5.8	2 15.7	2 25.5	2 35.4	2 45.3	2 55.1	3 5.0	3 14.8	3 24.7	3 34.5	3 44.4	3 54.3
47	2 6.0	2 15.9	2 25.7	2 35.6	2 45.4	2 55.3	3 5.1	3 15.0	3 24.8	3 34.7	3 44.6	3 54.4
48	2 6.2	2 16.0	2 25.9	2 35.7	2 45.6	2 55.4	3 5.3	3 15.2	3 25.0	3 34.9	3 44.7	3 54.6
49	2 6.3	2 16.2	2 26.0	2 35.9	2 45.8	2 55.6	3 5.5	3 15.3	3 25.2	3 35.0	3 44.9	3 54.7
50	2 6.5	2 16.3	2 26.2	2 36.1	2 45.9	2 55.8	3 5.6	3 15.5	3 25.3	3 35.2	3 45.1	3 54.9
51	2 6.7	2 16.5	2 26.4	2 36.2	2 46.1	2 55.9	3 5.8	3 15.7	3 25.5	3 35.4	3 45.2	3 55.1
52	2 6.8	2 16.7	2 26.5	2 36.4	2 46.2	2 56.1	3 6.0	3 15.8	3 25.7	3 35.5	3 45.4	3 55.2
53	2 7.0	2 16.8	2 26.7	2 36.6	2 46.4	2 56.3	3 6.1	3 16.0	3 25.8	3 35.7	3 45.5	3 55.4
54	2 7.1	2 17.0	2 26.9	2 36.7	2 46.6	2 56.4	3 6.3	3 16.1	3 26.0	3 35.9	3 45.7	3 55.6
55	2 7.3	2 17.2	2 27.0	2 36.9	2 46.7	2 56.6	3 6.5	3 16.3	3 26.2	3 36.0	3 45.9	3 55.7
56	2 7.5	2 17.3	2 27.2	2 37.0	2 46.9	2 56.8	3 6.6	3 16.5	3 26.3	3 36.2	3 46.0	3 55.9
57	2 7.6	2 17.5	2 27.4	2 37.2	2 47.1	2 56.9	3 6.8	3 16.6	3 26.5	3 36.4	3 46.2	3 56.1
58	2 7.8	2 17.7	2 27.5	2 37.4	2 47.2	2 57.1	3 6.9	3 16.8	3 26.7	3 36.5	3 46.4	3 56.2
59	2 8.0	2 17.8	2 27.7	2 37.5	2 47.4	2 57.3	3 7.1	3 17.0	3 26.8	3 36.7	3 46.5	3 56.4
Mean Solar.	12 <sup>h</sup> .	13 <sup>h</sup> .	14 <sup>h</sup> .	15 <sup>h</sup> .	16 <sup>h</sup> .	17 <sup>h</sup> .	18 <sup>h</sup> .	19 <sup>h</sup> .	20 <sup>h</sup> .	21 <sup>h</sup> .	22 <sup>h</sup> .	23 <sup>h</sup> .

## EXPLANATION OF THE MONTHLY EPHEMERIS OF THE SUN FOR GREENWICH APPARENT NOON.

The first page for each month contains, for Greenwich apparent noon of each day, *The Sun's Apparent Right Ascension*, and *Declination*, and the *Equation of Time*. Adjoining columns contain the differences of these quantities for one hour. By multiplying this difference by the hours and parts of an hour from Greenwich apparent noon, and adding the amount to, or subtracting it from, the quantity at noon, according as that quantity is increasing or decreasing, we obtain the value of any quantity for any given Greenwich apparent time. The hourly differences are given for the instant of apparent noon at Greenwich, and, when greater accuracy is required, should be first interpolated for half the hours and parts of an hour of the Greenwich apparent time.

This page is chiefly used when the sun is observed on the meridian, at which moment the local *apparent* time is  $0^h\ 0^m\ 0^s$ . The longitude from Greenwich expressed in time, if west, is at that instant the Greenwich apparent time, or time *after* Greenwich apparent noon; if east, it is time *before* Greenwich apparent noon. The longitude of any place is therefore employed in reducing the quantities on this page to apparent noon at that place.

The equation of time is the number of minutes and seconds to be added to or subtracted from the apparent time, or the time given by an observation of the sun, to obtain the mean time. The heading of the column directs the manner in which the equation is to be applied. When there is a change in the course of the month from addition to subtraction or the reverse (as in the months of April and June), the two different directions are separated by a line, while a corresponding line below points out the dates between which the change takes place. The equation of time, as given, is the mean time of apparent noon, or the hour-angle of the mean sun at that instant.

*The Sun's Semidiameter* is used in reducing the altitude of the upper or lower limb of the sun to the altitude of the center; and in reducing the angular distance of the limb from the moon, or some other object, to the distance from the centre of the sun.

The declination of the sun reduced to the meridian, or apparent noon, of the place, is required in finding the latitude from a meridian altitude of the sun.

As an example:

Let the sun's declination be required at apparent noon, 1898, May 30, at a place whose longitude is  $73^\circ\ 30'$ , or  $4^h\ 54^m$  west from Greenwich.

Local apparent time May 30 .....	$0^h\ 0^m$
Longitude from Greenwich (additive) .....	4 54
Greenwich apparent time May 30 .....	4 54

Reducing the minutes to decimals of an hour, we find that this moment is  $4^h.9$  after Greenwich apparent noon on May 30.

On page 14, we find that the change of declination in one hour is

May 30, at Greenwich apparent noon .....	22''.04
Multiply by .....	4 .9

We have for change in that time .....	108''.00
Declination at Greenwich noon, May 30 ...	N. $21^\circ\ 49'\ 8''.8$
Add change in $4^h.9 = 108''.00$ , or .....	1 48 .0

We have sun's declination at time of obs . . N.  $21^\circ\ 50'\ 56''.8$

LATITUDE BY MERIDIAN ALTITUDE.

**THE OBSERVATION.**—The usual practice at sea is to commence observing the altitude of the sun's lower limb above the sea horizon 20 to 30 minutes before noon, and then by the tangent-screw to follow the sun as long as it rises; as soon as the highest altitude is reached, the sun begins to fall and the lower limb will appear to *dip*. When the sun begins to dip the observation is complete, and the reading of the limb is taken.

In observing the meridian altitude of the moon or a star, the watch should be set beforehand to the time of its culmination.

**THE COMPUTATION.**—From the observed altitude deduce the true altitude, and thence the true zenith distance. Mark the zenith distance + or N. if the body is south of the zenith when on the meridian, — or S. if the body is north of the zenith when on the meridian.

Take out the declination of the body from the Nautical Almanac for the *Time of Meridian Passage*, having regard for its proper sign or name.

The algebraic sum of the declination and zenith distance will be the latitude; or, in other words, add together the zenith distance and the declination if they are of the same name, but, if they are of different names, take their difference; this sum or difference will be the latitude, which will be of the same name as the greater.

*Example.*—At sea, April 14, 1898, long.  $140^{\circ}$  E., the observed meridian altitude of the sun's lower limb was  $60^{\circ} 15' 30''$ ; sun bearing south; index corr.— $2' 30''$ ; height of the eye, 20 feet.

Obs. alt.,	$60^{\circ} 15' 30''$	I. C.,	$- 2' 30''$	Dec.,	$+9^{\circ} 31' 2''.8$ N.	H. D.,	$+ 53''.87$
Corr.,	$+ 8 37$	Dip.,	$- 4 23$	Corr.,	$- 8 22 .6$	Long.,	$- 9 .33$
		Ref.,	$- 0 33$				
<i>h</i>	$60 24 7$	Par.,	$+ 0 4$	<i>d</i>	$+9^{\circ} 22' 40''.2$ N.	Corr.,	$- 502''.61$
	$90$	S. D.,	$+15 59$			=	$-8' 22''.6$
<i>z</i>	$= +29 35 53$ N.	Corr.,	$+ 8' 37''$				
<i>d</i>	$= + 9 22 40 .2$ N.						
<i>L</i>	$= 38^{\circ} 58' 33''.2$ N.						

LONGITUDE AT SEA BY CHRONOMETER.

The process of determining the longitude at sea consists in comparing the local mean time with the Greenwich time at the same instant. The Greenwich time is found from the chronometer, which has previously been regulated and its error and rate tabulated. The daily rate being properly applied according to its sign or name, the Greenwich time can be known at any instant.

The local time is found by measuring the altitude of a celestial body above the sea horizon with the sextant, finding the hour-angle of the body, and thence the local time, which is compared with the Greenwich chronometer time of the instant of observation. The difference of these times is the longitude, which is *west* when the Greenwich time is the greater and *east* when it is the lesser.

The most favorable position of the celestial body for finding the hour-angle from its altitude is when nearest the prime vertical, provided the altitude is not so small as to be seriously affected by refraction.

In determining the longitude at sea from a. m. or p. m. observations of the sun, it is necessary to employ the latitude by account, carried back from the meridian observation for latitude for an a. m. observation or forward for a p. m. observation, making due allowance for current if sailing in one that is sufficiently well known to estimate its rate. The longitude thus determined is reduced for the run to noon.

In determining the longitude from night observations the latitude employed is that by account from the preceding noon and recorded for the time of observation.

*Example.*—At sea, May 18, 1898, a. m.; Lat.  $41^{\circ} 25' N.$ ; Long.  $133^{\circ} 30' W.$ , by D. R. from preceding noon, the following altitudes of the sun's lower limb were observed; the times noted by a watch compared with the Greenwich chronometer. Chro. corr.,  $+4^m 59^s$ ; I. C.,  $-1' 10''$ ; height of the eye, 17 feet; O—W,  $8^h 57^m 6^s$ .

Watch times,	$7^h 20^m 15^s$	☉,	$29^{\circ} 35' 30''$	I. C., — $1' 10''$
	20 47		41 20	Dip., — 4 2
	21 14		46 10	S. D., + 15 51
Mean,	<u>7 20 45.3</u>	Mean,	<u>29 41 0</u>	Ref., — 1 42
C—W,	8 57 6	Corr.,	+ 9 5	Par., + 0 8
Chro. t.,	16 17 51.3	<i>h</i>	= 29 50 5	Corr., + 9' 5''
Chro. corr.,	+ 4 59	<i>d</i>	= + 19 39 29	
Gr. m. t., May 18,	$4^h 22^m 50^s.3$	Eq. t.	= $3^m 46^s.4$ (— from app. t.)	

At noon, May 18, the latitude by meridian altitude was found to be  $41^{\circ} 40' N.$ ; the run of the ship from  $7^h 30^m$  a. m., ENE. (true), 18 miles.

Traverse Table, for course ENE., dist. 18; D. L. =  $6'.9 N.$ ; Dep. =  $16'.6 E.$ ; D. Long. =  $22'.2 E.$  Hence the Lat. by acc. at  $7^h 30^m$  was  $41^{\circ} 33'.$

<i>h</i>	= $29^{\circ} 50' 5''$			L. app. t.,	= $7^h 31^m 38^s.5$
<i>L</i>	= $41 33 0$	log sec	0.12588	Eq. t.,	= — 3 46.4
<i>p</i>	= $70 20 31$	log cosec	0.02608		
	<u>141 43 36</u>			L. m. t., May 17,	19 27 52.1
				Gr. m. t., May 18,	<u>4 22 50.3</u>
<i>s</i>	= $70 51 48$	log cos	3.51564	Long.	{ + 8 54 58.2
<i>s—h</i>	= $41 1 43$	log sin	9.81719		{ = $133^{\circ} 44' 33'' W.$
			<u>2)9.48479</u>	D. Long.	— 22 12
				Long. at noon,	<u><math>133^{\circ} 22' 21'' W.</math></u>
L. app. time = $7^h 31^m 38^s.5$	log sin $\frac{1}{2}$ t.	9.74240			

#### PHASES OF THE MOON.

The phases of the moon are given in the right-hand page of each month in Pacific Standard Time, according to civil reckoning.

 Pacific Standard Time is  $9^m 38^s$  faster than San Francisco Local Time.

## TIDE TABLES.

*Predicted time of high water for every day of the year 1898 at the following eight stations:*

San Diego, Cal. (La Playa).

San Francisco Entrance, Cal. (Fort Point).

Astoria, Oreg. (Columbia River).

Port Townsend, Wash.

Sitka, Alaska.

St. Paul, Kadiak Island, Alaska.

Honolulu, Hawaiian Islands (Oahu Island).

Panama, Colombia (on Naos Island).

For other ports, tables of *Tidal Constants* are added. They are used by applying the correction (adding if +, subtracting if —) to the time of high water, on the required day, at the principal port given above.

0<sup>h</sup> 00<sup>m</sup> is midnight, 12<sup>h</sup> 00<sup>m</sup> is noon. **Full-faced type** is used to designate noon to midnight; ordinary type to designate midnight to noon.

Complete tide tables, from which these tables are compiled, can be procured from the U. S. Coast and Geodetic Survey Office, or from its various agencies.

TIDE TABLES.

*Pacific Standard Time—Eight hours slower than Greenwich Time.*

SAN DIEGO, CAL. HIGH WATER, 1898.

Day of month.	January.		February.		March.		April.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	4 16	<b>5 46</b>	5 11	<b>8 26</b>	3 09	<b>7 41</b>	5 17	<b>6 50</b>
2	5 03	<b>7 12</b>	6 01	<b>8 35</b>	4 33	<b>7 50</b>	6 09	<b>7 05</b>
3	5 46	<b>8 10</b>	6 45	<b>8 47</b>	5 37	<b>7 51</b>	<b>7 28</b>	6 54
4	6 26	<b>8 46</b>	7 25	<b>9 03</b>	6 28	<b>7 59</b>	<b>7 55</b>	7 36
5	7 03	<b>9 16</b>	8 05	<b>9 24</b>	7 11	<b>8 16</b>	<b>8 25</b>	8 15
6	7 40	<b>9 41</b>	8 42	<b>9 47</b>	7 52	<b>8 39</b>	<b>8 54</b>	8 54
7	8 17	<b>10 05</b>	9 17	<b>10 11</b>	8 30	<b>9 02</b>	<b>9 27</b>	9 37
8	8 53	<b>10 31</b>	9 54	<b>10 37</b>	9 06	<b>9 26</b>	<b>10 01</b>	10 22
9	9 28	<b>10 57</b>	10 32	<b>11 06</b>	9 44	<b>9 58</b>	<b>10 41</b>	11 05
10	10 03	<b>11 26</b>	<b>11 42</b>	11 15	<b>10 30</b>	10 22	<b>11 30</b>	12 22
11	10 41	<b>11 57</b>	.. ..	<b>12 02</b>	<b>11 08</b>	11 08	.. ..	<b>1 52</b>
12	11 25	.. ..	0 28	<b>1 20</b>	<b>11 52</b>	<b>12 06</b>	0 35	<b>3 33</b>
13	0 35	<b>12 19</b>	1 30	<b>3 19</b>	.. ..	<b>1 32</b>	2 04	<b>4 50</b>
14	1 20	<b>1 34</b>	2 49	<b>5 25</b>	0 54	<b>3 37</b>	3 38	<b>5 40</b>
15	2 19	<b>3 20</b>	4 11	<b>6 38</b>	2 21	<b>5 23</b>	<b>6 16</b>	4 57
16	3 29	<b>5 10</b>	5 24	<b>7 24</b>	3 54	<b>6 18</b>	<b>6 50</b>	5 59
17	4 35	<b>6 35</b>	6 24	<b>8 00</b>	5 12	<b>6 55</b>	<b>7 23</b>	6 53
18	5 38	<b>7 35</b>	7 15	<b>8 35</b>	6 14	<b>7 29</b>	<b>7 55</b>	7 40
19	6 33	<b>8 20</b>	8 02	<b>9 08</b>	7 07	<b>8 01</b>	<b>8 25</b>	8 24
20	7 23	<b>9 01</b>	8 47	<b>9 40</b>	7 54	<b>8 32</b>	<b>8 54</b>	9 07
21	8 10	<b>9 40</b>	9 29	<b>10 12</b>	8 37	<b>9 02</b>	<b>9 20</b>	9 50
22	8 55	<b>10 17</b>	10 10	<b>10 42</b>	9 18	<b>9 32</b>	<b>9 44</b>	10 34
23	9 40	<b>10 54</b>	10 50	<b>11 09</b>	<b>10 01</b>	9 55	<b>10 06</b>	11 22
24	10 21	<b>11 30</b>	<b>11 38</b>	11 29	<b>10 25</b>	10 36	<b>10 29</b>	12 19
25	11 04	.. ..	.. ..	<b>12 17</b>	<b>10 49</b>	11 21	<b>10 52</b>	<b>1 37</b>
26	11 50	0 04	0 08	<b>1 32</b>	<b>11 09</b>	<b>12 15</b>	<b>11 26</b>	<b>2 51</b>
27	0 40	<b>12 42</b>	0 43	<b>7 12</b>	<b>11 32</b>	<b>1 38</b>	.. ..	<b>4 05</b>
28	1 19	<b>1 51</b>	1 41	<b>8 50</b>	.. ..	<b>6 00</b>	0 48	<b>5 19</b>
29	2 07	<b>3 47</b>	.. ..	.. ..	0 04	<b>7 55</b>	3 03	<b>5 24</b>
30	3 07	<b>6 00</b>	.. ..	.. ..	2 00	<b>6 38</b>	<b>5 40</b>	4 32
31	4 11	<b>7 20</b>	.. ..	.. ..	4 00	<b>6 50</b>	.. ..	.. ..

To reduce Pacific Standard Time to San Diego Local Time add 11 minutes.  
**Full-faced type** is used to designate noon to midnight.

## TIDE TABLES.

41

*Pacific Standard Time—Eight hours slower than Greenwich Time.*

## SAN DIEGO, CAL. HIGH WATER, 1898.

Day of month.	May.		June.		July.		August.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	<b>6 06</b>	5 38	<b>6 41</b>	7 10	<b>7 09</b>	8 05	<b>8 38</b>	9 15
2	<b>6 39</b>	6 31	<b>7 23</b>	8 03	<b>7 57</b>	8 53	<b>9 21</b>	9 51
3	<b>7 14</b>	7 19	<b>8 06</b>	8 54	<b>8 44</b>	9 36	<b>10 05</b>	10 27
4	<b>7 50</b>	8 05	<b>8 50</b>	9 42	<b>9 30</b>	10 19	<b>10 47</b>	11 03
5	<b>8 25</b>	8 51	<b>9 35</b>	10 32	<b>10 15</b>	11 01	<b>11 32</b>	11 37
6	<b>9 03</b>	9 40	<b>10 21</b>	11 23	<b>11 00</b>	11 43	<b>12 11</b>	...
7	<b>9 44</b>	10 30	<b>11 10</b>	<b>12 15</b>	<b>11 49</b>	<b>12 25</b>	<b>12 50</b>	0 24
8	<b>10 28</b>	11 26	...	<b>1 10</b>	...	<b>1 08</b>	<b>1 37</b>	1 28
9	<b>11 20</b>	<b>12 31</b>	0 06	<b>2 05</b>	<b>1 54</b>	0 45	<b>2 38</b>	3 11
10	...	<b>1 42</b>	1 12	<b>2 58</b>	<b>2 47</b>	1 55	<b>3 48</b>	7 08
11	0 22	<b>2 56</b>	<b>3 48</b>	2 31	<b>3 44</b>	3 27	<b>4 56</b>	7 58
12	1 40	<b>4 00</b>	<b>4 38</b>	3 59	<b>4 40</b>	5 17	<b>5 51</b>	8 14
13	<b>4 50</b>	3 07	<b>5 24</b>	5 20	<b>5 30</b>	6 59	<b>6 36</b>	8 25
14	<b>5 28</b>	4 28	<b>6 05</b>	6 34	<b>6 15</b>	8 00	<b>7 16</b>	8 38
15	<b>6 05</b>	5 40	<b>6 41</b>	7 36	<b>6 55</b>	8 40	<b>7 56</b>	8 52
16	<b>6 40</b>	6 38	<b>7 16</b>	8 29	<b>7 34</b>	9 10	<b>8 32</b>	9 10
17	<b>7 18</b>	7 30	<b>7 51</b>	9 14	<b>8 10</b>	9 34	<b>9 07</b>	9 31
18	<b>7 46</b>	8 20	<b>8 25</b>	9 52	<b>8 45</b>	9 56	<b>9 40</b>	9 52
19	<b>8 18</b>	9 07	<b>8 58</b>	10 28	<b>9 19</b>	10 18	<b>10 16</b>	10 15
20	<b>8 48</b>	9 52	<b>9 30</b>	10 59	<b>9 52</b>	10 41	<b>10 40</b>	<b>10 52</b>
21	<b>9 15</b>	10 36	<b>10 01</b>	11 30	<b>10 27</b>	11 05	11 12	<b>11 36</b>
22	<b>9 42</b>	11 21	<b>10 36</b>	<b>12 01</b>	<b>11 05</b>	11 31	11 53	...
23	<b>10 10</b>	<b>12 07</b>	<b>11 16</b>	<b>12 30</b>	<b>12 03</b>	<b>11 51</b>	<b>12 44</b>	0 41
24	<b>10 41</b>	<b>12 55</b>	...	<b>1 04</b>	<b>12 40</b>	...	<b>1 58</b>	2 31
25	<b>11 23</b>	<b>1 47</b>	<b>1 46</b>	0 05	<b>1 34</b>	0 50	<b>3 29</b>	4 48
26	...	<b>2 31</b>	<b>2 36</b>	1 15	<b>2 42</b>	2 29	<b>4 52</b>	6 14
27	0 25	<b>3 14</b>	<b>3 37</b>	2 58	<b>3 56</b>	4 31	<b>5 57</b>	7 00
28	<b>3 57</b>	2 00	<b>4 34</b>	4 38	<b>5 08</b>	6 12	<b>6 52</b>	7 36
29	<b>4 40</b>	3 42	<b>5 29</b>	6 05	<b>6 08</b>	7 14	<b>7 42</b>	8 10
30	<b>5 20</b>	5 03	<b>6 21</b>	7 12	<b>7 01</b>	8 00	<b>8 28</b>	8 44
31	<b>6 00</b>	6 11	...	...	<b>7 49</b>	8 39	<b>9 11</b>	9 17

To reduce Pacific Standard Time to San Diego Local Time add 11 minutes.

**Full-faced type** is used to designate noon to midnight.

*Pacific Standard Time—Eight hours slower than Greenwich Time.*

**SAN DIEGO, CAL. HIGH WATER, 1898.**

Day of month.	September.		October.		November.		December.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
1	h m <b>9 54</b>	h m 9 50	h m 9 43	h m <b>10 25</b>	h m 10 02	h m .. ..	h m 10 09	h m .. ..
2	10 22	<b>10 35</b>	10 10	<b>11 13</b>	10 27	0 13	10 40	0 42
3	10 52	<b>11 15</b>	10 37	.. ..	10 53	1 24	11 15	1 25
4	11 21	.. ..	11 02	0 09	11 27	6 02	<b>12 03</b>	2 04
5	11 53	0 08	11 28	1 28	<b>12 27</b>	8 00	<b>1 16</b>	2 40
6	<b>12 28</b>	1 18	<b>12 04</b>	7 28	<b>2 26</b>	4 57	3 20	<b>3 00</b>
7	<b>1 21</b>	4 00	<b>1 39</b>	8 54	5 04	<b>4 04</b>	4 02	<b>4 34</b>
8	<b>2 49</b>	5 16	<b>3 39</b>	10 20	5 19	<b>5 17</b>	4 46	<b>5 50</b>
9	<b>4 16</b>	6 31	<b>4 58</b>	5 36	5 45	<b>6 13</b>	5 30	<b>6 53</b>
10	<b>5 26</b>	7 46	<b>5 54</b>	6 37	6 16	<b>7 02</b>	6 15	<b>7 51</b>
11	<b>6 19</b>	7 40	<b>6 41</b>	6 50	6 51	<b>7 49</b>	7 00	<b>8 45</b>
12	<b>7 02</b>	7 47	<b>7 22</b>	7 09	7 27	<b>8 35</b>	7 45	<b>9 34</b>
13	<b>7 41</b>	8 02	7 36	<b>8 00</b>	8 03	<b>9 22</b>	8 30	<b>10 22</b>
14	<b>8 19</b>	8 21	8 04	<b>8 40</b>	8 41	<b>10 11</b>	9 15	<b>11 09</b>
15	<b>8 52</b>	8 43	8 32	<b>9 21</b>	9 21	<b>11 04</b>	10 01	<b>11 55</b>
16	<b>9 26</b>	9 09	9 03	<b>10 05</b>	10 05	.. ..	10 48	.. ..
17	9 36	<b>10 04</b>	9 37	<b>10 54</b>	10 53	0 01	11 40	0 35
18	10 05	<b>10 48</b>	10 16	<b>11 55</b>	11 50	1 06	<b>12 40</b>	1 25
19	10 39	<b>11 39</b>	11 01	.. ..	<b>1 00</b>	2 12	<b>1 51</b>	2 15
20	11 20	.. ..	11 58	1 13	<b>2 24</b>	3 16	3 08	<b>3 17</b>
21	<b>12 14</b>	0 55	<b>1 28</b>	2 45	4 08	<b>3 50</b>	4 04	<b>4 46</b>
22	<b>1 33</b>	2 50	<b>2 54</b>	4 08	4 52	<b>5 07</b>	4 55	<b>6 10</b>
23	<b>3 12</b>	4 44	<b>4 20</b>	5 04	5 36	<b>6 13</b>	5 42	<b>7 21</b>
24	<b>4 39</b>	5 47	<b>5 29</b>	5 45	6 17	<b>7 12</b>	6 25	<b>8 18</b>
25	<b>5 47</b>	6 27	6 21	<b>6 29</b>	6 54	<b>8 06</b>	7 01	<b>9 04</b>
26	<b>6 44</b>	7 02	6 56	<b>7 20</b>	7 29	<b>8 56</b>	7 40	<b>9 43</b>
27	<b>7 33</b>	7 35	7 30	<b>8 07</b>	8 03	<b>9 43</b>	8 17	<b>10 17</b>
28	<b>8 18</b>	8 08	8 04	<b>8 53</b>	8 37	<b>10 29</b>	8 52	<b>10 48</b>
29	8 40	<b>9 00</b>	8 35	<b>9 39</b>	9 10	<b>11 14</b>	9 26	<b>11 16</b>
30	9 12	<b>9 42</b>	9 06	<b>10 26</b>	9 40	<b>11 58</b>	9 57	<b>11 45</b>
31	.. ..	.. ..	9 35	<b>11 16</b>	.. ..	.. ..	10 30	.. ..

**To reduce Pacific Standard Time to San Diego Local Time *add* 11 minutes.**

**Full-faced type** is used to designate noon to midnight.

*Pacific Standard Time—Eight hours slower than Greenwich Time.*

## SAN FRANCISCO, CAL. HIGH WATER, 1898.

Day of month.	January.		February.		March.		April.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	6 21	8 10	7 01	10 22	5 10	9 14	9 00	6 59
2	7 05	9 26	7 50	10 55	6 18	9 45	9 19	8 01
3	7 45	10 28	8 35	11 21	7 21	10 09	9 41	8 52
4	8 24	11 15	9 20	11 44	8 17	10 29	10 05	9 39
5	9 01	11 55	10 05	.. ..	9 08	10 49	10 31	10 29
6	9 38	.. ..	10 48	0 07	9 52	11 08	10 59	11 19
7	10 14	0 25	11 31	0 29	10 35	11 29	11 34	12 12
8	10 54	0 55	12 15	0 51	11 19	11 52	.. ..	1 10
9	11 36	1 22	1 16	1 02	.. ..	12 06	0 12	2 12
10	12 20	1 48	1 44	1 53	0 20	1 00	0 54	3 24
11	1 07	2 13	2 17	3 00	0 51	2 00	1 42	4 43
12	2 42	3 00	2 57	4 20	1 30	3 09	2 45	5 55
13	3 13	3 59	3 44	5 59	2 16	4 34	4 04	6 55
14	3 49	4 15	4 40	7 35	3 10	6 06	7 44	5 29
15	4 30	5 50	5 42	8 48	4 17	7 26	8 20	6 49
16	5 16	7 28	6 51	9 40	5 33	8 22	8 56	8 00
17	6 08	8 54	7 58	10 21	6 47	9 05	9 30	9 01
18	7 04	9 59	9 00	10 58	7 58	9 42	10 02	10 00
19	8 02	10 50	9 55	11 32	9 00	10 15	10 32	10 53
20	8 59	11 33	10 48	.. ..	9 55	10 48	11 02	11 42
21	9 54	.. ..	11 38	0 06	10 48	11 17	11 30	12 30
22	10 49	0 12	0 37	12 28	11 45	11 38	.. ..	1 20
23	11 43	0 49	1 07	1 20	.. ..	12 29	0 00	2 12
24	12 36	1 26	1 38	2 18	0 15	1 20	0 30	3 11
25	2 03	1 33	2 11	3 21	0 45	2 14	1 00	4 15
26	2 36	2 32	2 46	4 39	1 15	3 15	1 30	5 18
27	3 12	3 36	3 25	6 28	1 48	4 33	2 07	6 12
28	3 53	4 52	4 11	8 17	2 22	6 10	6 45	3 16
29	4 36	6 29	.. ..	.. ..	3 06	7 35	7 15	4 45
30	5 21	8 18	.. ..	.. ..	4 09	8 16	7 44	6 19
31	6 12	9 34	.. ..	.. ..	5 42	5 39	.. ..	.. ..

To reduce Pacific Standard Time to San Francisco Local Time *subtract* 10 minutes.**Full-faced type** is used to designate noon to midnight.

## TIDE TABLES.

*Pacific Standard Time—Eight hours slower than Greenwich Time.*

## SAN FRANCISCO, CAL. HIGH WATER, 1898.

Day of month.	May.		June.		July.		August.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	<b>8 11</b>	7 36	<b>8 20</b>	9 38	<b>8 39</b>	10 44	<b>10 26</b>	11 48
2	<b>8 39</b>	8 37	<b>9 02</b>	10 40	<b>9 32</b>	11 34	<b>11 21</b>	<b>12 24</b>
3	<b>9 08</b>	9 35	<b>9 48</b>	11 38	<b>10 27</b>	<b>12 18</b>	.. ..	<b>12 59</b>
4	<b>9 40</b>	10 32	<b>10 35</b>	<b>12 30</b>	<b>11 32</b>	<b>1 00</b>	0 14	<b>1 32</b>
5	<b>10 18</b>	11 29	<b>11 26</b>	<b>1 21</b>	.. ..	<b>1 40</b>	1 09	<b>2 06</b>
6	<b>10 58</b>	<b>12 24</b>	.. ..	<b>2 11</b>	0 17	<b>2 20</b>	<b>2 41</b>	2 08
7	<b>11 41</b>	<b>1 22</b>	0 18	<b>3 00</b>	1 15	<b>2 59</b>	<b>3 21</b>	3 10
8	.. ..	<b>2 22</b>	1 17	<b>3 47</b>	<b>3 39</b>	2 17	<b>4 05</b>	4 24
9	0 29	<b>3 23</b>	2 24	<b>4 33</b>	<b>4 19</b>	3 25	<b>4 54</b>	6 00
10	1 23	<b>4 25</b>	<b>5 18</b>	3 39	<b>5 05</b>	4 42	<b>5 47</b>	7 48
11	2 31	<b>5 21</b>	<b>6 01</b>	5 01	<b>5 51</b>	6 10	<b>6 45</b>	9 12
12	<b>6 10</b>	3 51	<b>6 45</b>	6 26	<b>6 40</b>	7 45	<b>7 40</b>	10 04
13	<b>6 50</b>	5 18	<b>7 27</b>	7 49	<b>7 27</b>	9 09	<b>8 31</b>	10 40
14	<b>7 32</b>	6 40	<b>8 07</b>	9 02	<b>8 12</b>	10 13	<b>9 17</b>	11 07
15	<b>8 11</b>	7 58	<b>8 45</b>	10 06	<b>8 54</b>	11 01	<b>10 01</b>	11 30
16	<b>8 47</b>	9 50	<b>9 20</b>	11 01	<b>9 36</b>	11 40	<b>10 42</b>	11 51
17	<b>9 21</b>	10 00	<b>9 54</b>	11 50	<b>10 16</b>	<b>12 12</b>	<b>11 23</b>	<b>12 11</b>
18	<b>9 53</b>	10 55	<b>10 28</b>	<b>12 33</b>	<b>10 56</b>	<b>12 39</b>	.. ..	<b>12 21</b>
19	<b>10 24</b>	11 46	<b>11 03</b>	<b>1 10</b>	<b>11 35</b>	<b>1 04</b>	<b>0 04</b>	<b>12 52</b>
20	<b>10 54</b>	<b>12 35</b>	<b>11 39</b>	<b>1 45</b>	.. ..	<b>1 28</b>	<b>1 17</b>	0 46
21	<b>11 24</b>	<b>1 22</b>	.. ..	<b>2 17</b>	0 13	<b>1 50</b>	<b>1 46</b>	1 34
22	<b>11 54</b>	<b>2 09</b>	0 18	<b>2 45</b>	0 55	<b>2 15</b>	<b>2 21</b>	2 32
23	.. ..	<b>2 53</b>	0 59	<b>3 11</b>	<b>2 42</b>	1 44	<b>3 07</b>	3 44
24	0 29	<b>3 36</b>	<b>3 40</b>	1 45	<b>3 14</b>	2 38	<b>3 58</b>	5 17
25	1 04	<b>4 14</b>	<b>4 14</b>	2 44	<b>3 52</b>	3 38	<b>5 02</b>	6 55
26	1 50	<b>4 47</b>	<b>4 49</b>	3 55	<b>4 36</b>	5 05	<b>6 14</b>	8 18
27	<b>5 21</b>	2 51	<b>5 28</b>	5 17	<b>5 28</b>	6 50	<b>7 24</b>	9 12
28	<b>5 56</b>	4 12	<b>6 11</b>	6 52	<b>6 26</b>	8 28	<b>8 31</b>	9 55
29	<b>6 31</b>	5 44	<b>6 57</b>	8 25	<b>7 30</b>	9 38	<b>9 31</b>	10 31
30	<b>7 06</b>	7 12	<b>7 47</b>	9 42	<b>8 31</b>	10 30	<b>10 27</b>	11 06
31	<b>7 42</b>	8 28	.. ..	.. ..	<b>9 31</b>	11 10	<b>11 20</b>	11 40

To reduce Pacific Standard Time to San Francisco Local Time *subtract* 10 minutes.**Full-faced type** is used to designate noon to midnight.

*Pacific Standard Time—Eight hours slower than Greenwich Time.*

SAN FRANCISCO, CAL. HIGH WATER, 1898.

Day of month.	September.		October.		November.		December.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	.. ..	<b>12 10</b>	11 53	0 15	<b>12 20</b>	2 04	<b>12 29</b>	2 41
2	0 11	<b>12 41</b>	<b>12 25</b>	1 08	<b>12 55</b>	3 01	<b>1 06</b>	3 22
3	<b>1 13</b>	1 05	<b>1 00</b>	2 02	<b>1 29</b>	4 00	4 00	<b>1 50</b>
4	<b>1 48</b>	2 02	<b>1 36</b>	3 04	<b>2 09</b>	4 57	4 28	<b>2 41</b>
5	<b>2 23</b>	3 04	<b>2 14</b>	4 16	5 47	<b>3 07</b>	5 00	<b>3 52</b>
6	<b>3 04</b>	4 18	<b>2 57</b>	5 40	6 19	<b>4 29</b>	5 32	<b>5 17</b>
7	<b>3 51</b>	5 56	<b>4 00</b>	6 59	6 48	<b>5 57</b>	6 04	<b>6 42</b>
8	<b>4 52</b>	7 43	7 50	<b>5 24</b>	7 19	<b>7 16</b>	6 38	<b>8 02</b>
9	<b>6 03</b>	8 48	8 19	<b>6 45</b>	7 45	<b>8 24</b>	7 12	<b>9 17</b>
10	<b>7 11</b>	9 25	8 38	<b>7 51</b>	8 13	<b>9 22</b>	7 50	<b>10 22</b>
11	<b>8 10</b>	9 52	8 58	<b>8 45</b>	8 43	<b>10 19</b>	8 32	<b>11 20</b>
12	<b>9 00</b>	10 12	9 20	<b>9 30</b>	9 12	<b>11 15</b>	9 18	.. ..
13	<b>9 45</b>	10 31	9 43	<b>10 19</b>	9 51	.. ..	10 08	0 12
14	10 50	<b>10 28</b>	10 08	<b>11 09</b>	10 30	0 10	11 00	1 00
15	11 09	<b>11 11</b>	10 34	.. ..	11 15	1 05	11 54	1 47
16	11 30	<b>11 55</b>	11 08	0 00	<b>12 00</b>	2 01	<b>12 53</b>	2 33
17	11 56	.. ..	11 45	0 54	<b>12 55</b>	2 57	<b>1 57</b>	3 18
18	<b>12 25</b>	0 45	<b>12 25</b>	1 54	<b>2 00</b>	3 52	3 58	<b>3 07</b>
19	<b>1 02</b>	1 40	<b>1 11</b>	2 59	<b>3 15</b>	4 44	4 39	<b>4 26</b>
20	<b>1 44</b>	2 43	<b>2 08</b>	4 08	5 30	<b>4 37</b>	5 24	<b>5 50</b>
21	<b>2 32</b>	3 59	<b>3 20</b>	5 15	6 14	<b>6 01</b>	6 10	<b>7 14</b>
22	<b>3 33</b>	5 26	<b>4 44</b>	6 16	6 56	<b>7 23</b>	6 55	<b>8 34</b>
23	<b>4 50</b>	6 46	7 02	<b>6 10</b>	7 37	<b>8 36</b>	7 39	<b>9 44</b>
24	<b>6 11</b>	7 47	7 43	<b>7 28</b>	8 16	<b>9 38</b>	8 20	<b>10 44</b>
25	<b>7 25</b>	8 33	8 21	<b>8 25</b>	8 54	<b>10 38</b>	9 00	<b>11 34</b>
26	<b>8 31</b>	9 12	8 59	<b>9 37</b>	9 30	<b>11 32</b>	9 39	.. ..
27	<b>9 32</b>	9 46	9 34	<b>10 34</b>	10 04	.. ..	10 17	0 18
28	10 19	<b>10 29</b>	10 07	<b>11 27</b>	10 39	0 23	10 53	0 56
29	10 50	<b>11 22</b>	10 40	.. ..	11 15	1 11	11 32	1 30
30	11 21	.. ..	11 12	0 19	11 52	1 58	<b>12 13</b>	2 01
31	.. ..	.. ..	11 46	1 11	.. ..	.. ..	<b>12 55</b>	2 31

To reduce Pacific Standard Time to San Francisco Local Time *subtract* 10 minutes.

**Full-faced type** is used to designate noon to midnight.

## TIDE TABLES.

*Pacific Standard Time—Eight hours slower than Greenwich Time.*

## ASTORIA, OREG. HIGH WATER, 1898.

Day of month.	January.		February.		March.		April.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	7 20	<b>8 54</b>	8 20	<b>10 54</b>	6 22	<b>9 09</b>	8 20	<b>9 48</b>
2	8 13	<b>10 08</b>	9 25	<b>11 39</b>	7 36	<b>10 14</b>	<b>10 30</b>	9 28
3	9 07	<b>11 10</b>	10 23	.. ..	8 53	<b>10 54</b>	<b>11 08</b>	10 25
4	10 02	<b>11 58</b>	11 10	0 11	9 57	<b>11 27</b>	<b>11 41</b>	11 15
5	10 50	.. ..	11 51	0 41	10 48	<b>11 58</b>	.. ..	<b>12 01</b>
6	11 31	0 37	<b>12 31</b>	1 09	11 33	.. ..	0 14	<b>12 46</b>
7	<b>12 10</b>	1 11	<b>1 10</b>	1 33	<b>12 16</b>	0 26	0 49	<b>1 30</b>
8	<b>12 47</b>	1 41	2 01	<b>1 51</b>	0 56	<b>12 58</b>	1 25	<b>2 18</b>
9	<b>1 24</b>	2 07	2 32	<b>2 34</b>	1 28	<b>1 41</b>	2 02	<b>3 06</b>
10	<b>2 03</b>	2 33	3 05	<b>3 20</b>	2 00	<b>2 25</b>	2 45	<b>3 55</b>
11	3 04	<b>2 44</b>	3 40	<b>4 11</b>	2 33	<b>3 11</b>	3 31	<b>4 54</b>
12	3 36	<b>3 32</b>	4 20	<b>5 10</b>	3 10	<b>4 03</b>	4 26	<b>6 02</b>
13	4 12	<b>4 25</b>	5 05	<b>6 19</b>	3 51	<b>4 57</b>	5 33	<b>7 16</b>
14	4 52	<b>5 26</b>	6 02	<b>7 58</b>	4 41	<b>6 11</b>	6 51	<b>8 22</b>
15	5 40	<b>6 40</b>	7 11	<b>9 25</b>	5 43	<b>7 42</b>	8 14	<b>9 19</b>
16	6 35	<b>8 12</b>	8 28	<b>10 34</b>	6 57	<b>9 00</b>	<b>10 07</b>	9 29
17	7 38	<b>9 40</b>	9 42	<b>11 26</b>	8 19	<b>10 01</b>	<b>10 52</b>	10 30
18	8 46	<b>10 53</b>	10 50	.. ..	9 36	<b>10 50</b>	<b>11 35</b>	11 21
19	9 55	<b>11 50</b>	11 47	0 10	10 42	<b>11 34</b>	.. ..	<b>12 09</b>
20	10 58	.. ..	<b>12 37</b>	0 50	11 36	.. ..	0 11	<b>12 54</b>
21	11 54	0 38	<b>1 23</b>	1 27	<b>12 24</b>	0 13	0 47	<b>1 36</b>
22	<b>12 45</b>	1 19	2 02	<b>2 08</b>	0 49	<b>1 08</b>	1 19	<b>2 18</b>
23	<b>1 33</b>	1 59	2 36	<b>2 48</b>	1 25	<b>1 50</b>	1 51	<b>2 59</b>
24	<b>2 19</b>	2 35	3 07	<b>3 31</b>	1 58	<b>2 31</b>	2 22	<b>3 39</b>
25	3 09	<b>3 05</b>	3 38	<b>4 16</b>	2 29	<b>3 14</b>	2 54	<b>4 14</b>
26	3 41	<b>3 52</b>	4 10	<b>5 09</b>	2 59	<b>3 57</b>	3 30	<b>5 00</b>
27	4 17	<b>4 42</b>	4 45	<b>6 16</b>	3 30	<b>4 42</b>	4 10	<b>5 55</b>
28	4 54	<b>5 42</b>	5 27	<b>7 40</b>	4 03	<b>5 30</b>	5 05	<b>6 52</b>
29	5 33	<b>6 54</b>	.. ..	.. ..	4 43	<b>6 39</b>	<b>7 47</b>	6 19
30	6 20	<b>8 20</b>	.. ..	.. ..	5 38	<b>7 58</b>	<b>8 36</b>	7 44
31	7 14	<b>9 49</b>	.. ..	.. ..	6 57	<b>9 01</b>	.. ..	.. ..

To reduce Pacific Standard Time to Astoria Local Time *subtract* 15 minutes.**Full-faced type** is used to designate noon to midnight.

*Pacific Standard Time—Eight hours slower than Greenwich Time.*

## ASTORIA, OREG. HIGH WATER, 1898.

Day of month.	May.		June.		July.		August.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	9 24	8 57	10 13	10 40	10 38	11 32	.. ..	12 51
2	10 09	9 59	11 02	11 38	11 32	12 25	0 18	1 31
3	10 54	10 55	11 50	12 31	.. ..	1 12	1 07	2 08
4	11 34	11 47	.. ..	1 21	0 24	1 50	1 55	2 43
5	.. ..	12 37	0 37	2 10	1 15	2 37	3 19	2 42
6	0 14	1 26	1 24	2 55	2 04	3 14	3 56	3 31
7	0 55	2 14	2 14	3 39	2 55	3 53	4 33	4 23
8	1 39	3 01	3 07	4 24	4 35	3 49	5 16	5 23
9	2 25	3 51	4 06	5 13	5 20	4 49	6 05	6 34
10	3 18	4 45	6 04	5 12	6 07	5 55	7 05	8 04
11	4 17	5 43	6 55	6 23	6 59	7 09	8 10	9 29
12	5 26	6 42	7 47	7 38	7 54	8 27	9 15	10 35
13	7 36	6 45	8 38	8 50	8 48	9 43	10 14	11 19
14	8 31	8 02	9 27	9 56	9 42	10 47	11 00	11 53
15	9 21	9 10	10 15	10 55	10 35	11 38	11 40	12 22
16	10 10	10 11	11 01	11 47	11 20	12 19	.. ..	12 50
17	10 54	11 06	11 42	12 32	11 58	12 54	0 18	1 14
18	11 35	11 56	.. ..	1 13	.. ..	1 25	1 42	0 55
19	.. ..	12 41	0 18	1 50	0 35	1 52	2 11	1 34
20	0 11	1 25	0 53	2 22	1 10	2 16	2 41	2 14
21	0 45	2 05	1 28	2 49	2 44	1 48	3 14	2 58
22	1 19	2 44	2 04	3 21	3 16	2 27	3 51	3 45
23	1 51	3 15	2 42	3 55	3 50	3 12	4 35	4 40
24	2 24	3 51	4 31	3 29	4 26	4 02	5 28	5 42
25	3 01	4 30	5 10	4 24	5 11	5 00	6 38	7 16
26	3 46	5 15	5 54	5 23	6 03	6 08	7 55	8 53
27	6 00	4 40	6 46	6 36	7 04	7 33	9 12	10 04
28	6 45	5 51	7 42	7 57	8 12	9 07	10 22	10 57
29	7 35	7 09	8 42	9 19	9 22	10 22	11 21	11 42
30	8 30	8 26	9 42	10 31	10 28	11 21	.. ..	12 21
31	9 23	9 37	.. ..	.. ..	11 26	12 09	0 12	12 59

To reduce Pacific Standard Time to Astoria Local Time *subtract* 15 minutes.**Full-faced type** is used to designate noon to midnight.

## TIDE TABLES.

*Pacific Standard Time—Eight hours slower than Greenwich time.*

ASTORIA, OREG. HIGH WATER, 1898.

Day of month.	September.		October.		November.		December.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	0 59	<b>1 35</b>	<b>1 34</b>	1 31	<b>2 05</b>	2 40	<b>2 13</b>	3 01
2	<b>2 10</b>	1 44	<b>2 08</b>	2 14	<b>2 37</b>	3 21	<b>2 48</b>	3 32
3	<b>2 44</b>	2 28	<b>2 40</b>	2 56	<b>3 12</b>	3 55	<b>3 27</b>	4 06
4	<b>3 16</b>	3 12	<b>3 13</b>	3 41	<b>3 50</b>	4 38	4 45	<b>4 16</b>
5	<b>3 50</b>	3 59	<b>3 48</b>	4 28	<b>4 40</b>	5 28	5 25	<b>5 16</b>
6	<b>4 29</b>	4 53	<b>4 31</b>	5 16	6 22	<b>5 51</b>	6 08	<b>6 31</b>
7	<b>5 15</b>	6 01	<b>5 27</b>	6 24	7 18	<b>7 09</b>	6 56	<b>7 52</b>
8	<b>6 15</b>	7 30	<b>6 48</b>	7 44	8 08	<b>8 32</b>	7 52	<b>9 10</b>
9	<b>7 32</b>	8 59	<b>8 10</b>	8 41	8 58	<b>9 41</b>	8 49	<b>10 19</b>
10	<b>8 50</b>	10 00	<b>9 17</b>	9 28	9 45	<b>10 38</b>	9 43	<b>11 20</b>
11	<b>9 52</b>	10 40	10 06	<b>10 11</b>	10 30	<b>11 29</b>	10 34	.. ..
12	<b>10 40</b>	11 10	10 44	<b>10 59</b>	11 09	.. ..	11 22	0 12
13	<b>11 23</b>	11 40	11 17	<b>11 42</b>	11 48	0 16	<b>12 10</b>	1 00
14	.. ..	<b>12 06</b>	11 48	.. ..	<b>12 28</b>	1 03	<b>12 58</b>	1 45
15	<b>12 34</b>	0 03	<b>12 21</b>	0 25	<b>1 09</b>	1 48	<b>1 46</b>	2 28
16	<b>1 04</b>	0 42	<b>12 55</b>	1 07	<b>1 53</b>	2 31	<b>2 36</b>	3 07
17	<b>1 34</b>	1 21	<b>1 30</b>	1 50	<b>2 41</b>	3 17	<b>3 30</b>	3 49
18	<b>2 05</b>	2 02	<b>2 10</b>	2 34	<b>3 37</b>	4 07	<b>4 34</b>	<b>4 28</b>
19	<b>2 40</b>	2 46	<b>2 54</b>	3 19	<b>4 41</b>	5 01	5 21	<b>5 37</b>
20	<b>3 20</b>	3 34	<b>3 46</b>	4 14	5 57	<b>5 55</b>	6 11	<b>6 52</b>
21	<b>4 07</b>	4 23	<b>4 50</b>	5 18	6 55	<b>7 19</b>	7 05	<b>8 11</b>
22	<b>5 06</b>	5 32	<b>6 06</b>	6 29	7 51	<b>8 35</b>	8 00	<b>9 28</b>
23	<b>6 22</b>	7 00	<b>7 34</b>	7 39	8 47	<b>9 45</b>	8 55	<b>10 35</b>
24	<b>7 46</b>	8 26	<b>8 55</b>	8 40	9 39	<b>10 45</b>	9 49	<b>11 32</b>
25	<b>9 08</b>	9 34	9 33	<b>10 03</b>	10 28	<b>11 39</b>	10 42	.. ..
26	<b>10 17</b>	10 24	10 20	<b>10 58</b>	11 12	.. ..	11 29	0 20
27	<b>11 14</b>	11 07	11 07	<b>11 47</b>	11 54	0 26	<b>12 09</b>	1 01
28	.. ..	11 47	11 46	.. ..	<b>12 30</b>	1 10	<b>12 45</b>	1 38
29	<b>12 25</b>	0 03	<b>12 23</b>	0 33	<b>1 05</b>	1 51	<b>1 20</b>	2 11
30	<b>1 00</b>	0 48	<b>12 58</b>	1 17	<b>1 39</b>	2 29	<b>1 55</b>	2 36
31	.. ..	.. ..	<b>1 32</b>	1 59	.. ..	.. ..	<b>2 31</b>	3 02

To reduce Pacific Standard Time to Astoria Local Time *subtract* 15 minutes.**Full-faced type** is used to designate noon to midnight.

*Pacific Standard Time—Eight hours slower than Greenwich time.*

PORT TOWNSEND, WASH. HIGH WATER, 1898.

Day of month.	January.		February.		March.		April.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	10 15	0 45	3 15	9 00	1 30	6 40	1 05	11 00
2	10 55	2 00	3 47	10 00	2 20	6 55	1 32	<b>12 35</b>
3	11 40	2 50	4 10	11 30	2 51	8 35	1 52	<b>1 45</b>
4	3 37	<b>12 12</b>	4 30	<b>1 00</b>	3 08	11 00	2 10	<b>2 41</b>
5	4 16	<b>12 43</b>	4 45	<b>2 10</b>	3 25	<b>1 12</b>	2 30	<b>3 33</b>
6	4 45	<b>1 25</b>	5 00	<b>3 12</b>	3 38	<b>2 36</b>	<b>4 26</b>	3 00
7	5 10	<b>2 14</b>	5 13	<b>4 08</b>	3 52	<b>3 31</b>	<b>5 18</b>	3 36
8	5 32	<b>3 00</b>	5 32	<b>5 03</b>	4 10	<b>4 17</b>	<b>6 12</b>	4 02
9	5 55	<b>3 40</b>	5 54	<b>5 58</b>	4 30	<b>5 07</b>	<b>7 07</b>	4 28
10	6 20	<b>4 30</b>	6 18	<b>6 58</b>	4 57	<b>6 04</b>	<b>8 07</b>	4 56
11	6 45	<b>5 35</b>	6 43	<b>8 03</b>	5 32	<b>7 03</b>	<b>9 08</b>	5 31
12	7 08	<b>6 47</b>	7 19	<b>9 23</b>	5 58	<b>8 05</b>	<b>10 10</b>	6 12
13	7 33	<b>8 05</b>	7 46	<b>11 08</b>	6 24	<b>9 16</b>	<b>11 12</b>	7 23
14	8 00	<b>9 30</b>	8 10	.. ..	6 55	<b>10 43</b>	.. ..	9 15
15	8 30	<b>11 20</b>	8 43	1 15	7 30	.. ..	0 03	11 05
16	9 00	.. ..	9 37	2 23	0 12	8 35	0 45	<b>12 52</b>
17	9 30	1 45	3 06	11 25	1 12	10 26	1 22	<b>2 05</b>
18	10 03	2 57	3 37	<b>1 08</b>	1 57	<b>12 17</b>	1 53	<b>3 05</b>
19	10 55	3 45	4 05	<b>2 30</b>	2 32	<b>1 48</b>	2 28	<b>4 03</b>
20	4 23	<b>12 23</b>	4 31	<b>3 35</b>	3 02	<b>2 53</b>	3 07	<b>4 58</b>
21	4 55	<b>1 53</b>	4 55	<b>4 37</b>	3 30	<b>3 46</b>	<b>5 47</b>	3 33
22	5 20	<b>3 05</b>	5 21	<b>5 32</b>	3 56	<b>4 42</b>	<b>6 35</b>	3 53
23	5 46	<b>4 16</b>	5 47	<b>6 28</b>	<b>5 34</b>	4 24	<b>7 20</b>	4 08
24	6 12	<b>5 21</b>	6 13	<b>7 28</b>	<b>6 29</b>	5 00	<b>8 03</b>	3 55
25	6 40	<b>6 23</b>	6 35	<b>8 37</b>	<b>7 25</b>	5 25	<b>8 47</b>	3 40
26	7 08	<b>7 28</b>	6 52	<b>10 02</b>	5 43	<b>8 22</b>	<b>9 28</b>	3 40
27	7 35	<b>8 45</b>	7 00	<b>11 55</b>	5 50	<b>9 24</b>	<b>10 10</b>	4 05
28	8 00	<b>10 25</b>	6 50	.. ..	<b>10 33</b>	5 55	<b>10 45</b>	5 30
29	8 30	.. ..	.. ..	.. ..	<b>11 45</b>	6 00	<b>11 18</b>	8 00
30	8 50	0 36	.. ..	.. ..	.. ..	7 00	<b>11 45</b>	10 55
31	8 50	2 20	.. ..	.. ..	0 32	9 00	.. ..	.. ..

To reduce Pacific Standard Time to Port Townsend Local Time *subtract* 11 minutes.

**Full-faced type** is used to designate noon to midnight.

## TIDE TABLES.

*Pacific Standard Time—Eight hours slower than Greenwich Time.*

## PORT TOWNSEND, WASH. HIGH WATER, 1898.

Day of month.	May.		June.		July.		August.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	.. ..	<b>12 40</b>	<b>11 54</b>	<b>3 22</b>	<b>11 30</b>	<b>4 22</b>	<b>4 50</b>	1 17
2	0 10	<b>1 53</b>	.. ..	<b>4 17</b>	.. ..	<b>5 02</b>	<b>5 18</b>	2 38
3	0 45	<b>2 50</b>	0 20	<b>5 03</b>	<b>5 33</b>	0 20	<b>5 44</b>	3 50
4	1 25	<b>3 48</b>	<b>5 45</b>	0 54	<b>6 00</b>	1 40	<b>6 13</b>	4 58
5	1 48	<b>4 40</b>	<b>6 25</b>	1 35	<b>6 32</b>	3 10	<b>6 41</b>	6 03
6	2 13	<b>5 33</b>	<b>7 03</b>	2 30	<b>7 03</b>	4 31	<b>7 10</b>	7 12
7	<b>6 23</b>	2 41	<b>7 40</b>	3 45	<b>7 35</b>	5 50	<b>7 42</b>	8 26
8	<b>7 13</b>	3 15	<b>8 18</b>	5 15	<b>8 06</b>	7 05	<b>8 27</b>	9 58
9	<b>8 01</b>	4 00	<b>8 56</b>	6 50	<b>8 38</b>	8 26	<b>9 00</b>	11 40
10	<b>8 50</b>	4 50	<b>9 30</b>	8 21	<b>9 08</b>	10 02	<b>9 25</b>	<b>1 28</b>
11	<b>9 36</b>	6 10	<b>10 05</b>	10 03	<b>9 50</b>	11 56	<b>9 30</b>	<b>9 50</b>
12	<b>10 22</b>	7 55	<b>10 38</b>	11 48	<b>10 32</b>	<b>1 35</b>	<b>3 12</b>	<b>10 30</b>
13	<b>11 02</b>	9 40	<b>11 23</b>	<b>1 27</b>	<b>11 05</b>	<b>2 46</b>	<b>3 43</b>	<b>11 50</b>
14	<b>11 38</b>	11 35	.. ..	<b>2 42</b>	<b>11 40</b>	<b>3 40</b>	<b>4 05</b>	.. ..
15	.. ..	<b>1 13</b>	0 02	<b>3 42</b>	<b>4 20</b>	<b>11 50</b>	<b>4 20</b>	1 10
16	0 12	<b>2 28</b>	0 30	<b>4 30</b>	<b>4 51</b>	<b>11 55</b>	<b>4 33</b>	2 13
17	0 54	<b>3 30</b>	<b>5 13</b>	0 45	<b>5 17</b>	.. ..	<b>4 48</b>	3 09
18	1 33	<b>4 25</b>	<b>5 48</b>	0 55	<b>5 32</b>	0 20	<b>5 06</b>	4 00
19	2 00	<b>5 13</b>	<b>6 16</b>	0 50	<b>5 48</b>	2 00	<b>5 25</b>	4 50
20	<b>5 56</b>	2 18	<b>6 34</b>	0 55	<b>6 07</b>	3 30	<b>5 48</b>	5 45
21	<b>6 33</b>	2 00	<b>6 58</b>	1 30	<b>6 28</b>	4 35	<b>6 15</b>	6 40
22	<b>7 07</b>	2 00	<b>7 22</b>	2 45	<b>6 48</b>	5 38	<b>6 40</b>	7 44
23	<b>7 37</b>	2 10	<b>7 47</b>	4 15	<b>7 10</b>	6 37	<b>7 10</b>	8 57
24	<b>8 07</b>	2 30	<b>8 10</b>	6 00	<b>7 35</b>	7 47	<b>7 40</b>	10 25
25	<b>8 38</b>	3 20	<b>8 33</b>	7 40	<b>8 01</b>	9 08	<b>8 15</b>	<b>12 10</b>
26	<b>9 08</b>	4 30	<b>8 58</b>	9 10	<b>8 32</b>	10 45	<b>9 20</b>	<b>1 38</b>
27	<b>9 34</b>	6 20	<b>9 35</b>	10 45	<b>9 05</b>	<b>12 55</b>	<b>9 25</b>	<b>10 40</b>
28	<b>10 01</b>	8 50	<b>10 00</b>	<b>12 45</b>	<b>9 35</b>	<b>2 25</b>	<b>2 57</b>	.. ..
29	<b>10 26</b>	10 55	<b>10 25</b>	<b>2 32</b>	<b>10 30</b>	<b>3 25</b>	<b>3 27</b>	0 40
30	<b>11 03</b>	<b>12 40</b>	<b>10 51</b>	<b>3 33</b>	<b>11 50</b>	<b>3 55</b>	<b>3 55</b>	2 01
31	<b>11 34</b>	<b>2 15</b>	.. ..	.. ..	<b>4 25</b>	.. ..	<b>4 20</b>	3 12

To reduce Pacific Standard Time to Port Townsend Local Time *subtract* 11 minutes.**Full-faced type** is used to designate noon to midnight.

## TIDE TABLES.

51

*Pacific Standard Time—Eight hours slower than Greenwich Time.*

PORT TOWNSEND, WASH. HIGH WATER, 1898.

Day of month.	September.		October.		November.		December.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	4 48	4 12	4 38	5 15	7 06	3 50	7 19	2 40
2	5 20	5 05	6 12	4 52	7 50	3 50	7 47	3 30
3	5 45	6 07	7 09	5 13	8 32	4 00	8 18	4 50
4	6 22	7 10	8 08	5 19	9 15	6 00	8 47	6 50
5	6 53	8 21	9 13	5 00	9 55	8 00	9 11	8 50
6	7 10	9 47	10 22	5 20	10 33	10 00	9 35	10 45
7	7 10	11 25	11 25	6 50	11 02	11 30	9 57	.. ..
8	12 50	7 40	12 11	8 50	11 27	.. ..	10 30	0 20
9	1 50	9 00	12 47	10 55	11 50	0 50	11 00	2 10
10	3 20	11 20	1 10	.. ..	12 25	2 07	11 20	3 28
11	3 40	.. ..	1 30	1 00	12 55	2 57	11 50	4 13
12	3 55	0 35	1 43	2 03	1 18	3 45	12 28	4 53
13	3 09	1 43	2 02	2 40	1 40	4 30	5 28	1 18
14	3 24	2 38	2 30	3 25	2 08	5 17	6 00	2 15
15	3 40	3 22	3 00	4 12	6 02	2 42	6 33	3 30
16	3 57	4 02	3 24	5 01	6 47	3 20	7 08	4 50
17	4 20	4 52	5 52	3 44	7 33	4 08	7 45	6 11
18	4 50	5 45	6 45	4 08	8 17	5 25	8 20	7 37
19	5 17	6 40	7 40	4 38	9 02	7 03	8 55	9 13
20	5 40	7 40	8 37	5 15	9 47	9 00	9 50	11 08
21	6 05	8 48	9 37	6 10	10 28	11 00	10 04	.. ..
22	6 38	10 07	10 35	8 10	11 06	.. ..	10 52	1 00
23	11 25	7 40	11 28	10 30	11 42	0 47	11 35	2 28
24	12 31	9 40	12 11	.. ..	12 25	2 10	12 15	3 30
25	1 17	11 40	12 48	0 25	1 05	3 16	4 17	12 50
26	1 53	.. ..	1 20	1 45	1 40	4 10	4 58	1 25
27	2 25	1 23	1 55	2 48	4 58	2 07	5 33	2 00
28	2 54	2 30	2 30	3 48	5 42	2 30	6 02	2 30
29	3 22	3 23	3 03	4 40	6 20	2 30	6 19	3 20
30	3 55	4 18	5 32	3 27	6 53	2 20	6 41	4 05
31	.. ..	.. ..	6 20	3 42	.. ..	.. ..	7 02	5 00

To reduce Pacific Standard Time to Port Townsend Local Time *subtract* 11 minutes.**Full-faced type** is used to designate noon to midnight.

*Sitka Standard Time—Nine hours slower than Greenwich Time.*

SITKA, ALASKA. HIGH WATER, 1898.

Day of month.	January.		February.		March.		April.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	7 01	8 39	7 57	10 41	5 51	8 55	9 25	7 48
2	7 57	9 59	9 01	11 20	7 05	9 57	10 03	9 00
3	8 51	10 57	9 58	11 50	8 25	10 31	10 38	9 58
4	9 40	11 41	10 46	.. ..	9 32	11 00	11 10	10 49
5	10 24	.. ..	11 29	0 16	10 25	11 25	11 41	11 34
6	11 08	0 18	12 09	0 39	11 10	11 52	.. ..	12 11
7	11 47	0 50	12 47	1 04	11 53	.. ..	0 14	12 54
8	12 24	1 16	1 25	1 30	12 33	0 20	0 46	1 39
9	1 00	1 42	1 58	2 03	1 12	0 40	1 20	2 25
10	1 36	2 08	2 30	2 42	1 18	1 48	1 59	2 15
11	2 15	2 35	3 01	3 25	1 53	2 29	2 40	4 12
12	3 05	3 00	3 38	4 17	2 26	3 15	3 31	5 22
13	3 38	3 48	4 20	5 26	3 04	4 11	4 36	6 43
14	4 14	4 37	5 14	7 05	3 49	5 21	7 56	6 07
15	5 00	5 45	6 25	9 04	4 47	6 58	8 58	7 49
16	5 52	7 19	7 52	10 20	6 10	8 37	9 49	9 16
17	6 56	9 10	9 17	11 11	7 50	9 43	10 32	10 20
18	8 09	10 33	10 27	11 50	10 31	9 17	11 11	11 11
19	9 20	11 30	11 26	.. ..	11 11	10 27	11 47	12 00
20	10 26	.. ..	12 17	0 26	11 50	11 24	.. ..	12 44
21	11 24	0 16	0 59	1 05	.. ..	12 12	0 22	1 25
22	12 18	0 56	1 31	1 47	0 28	12 54	0 55	2 05
23	1 08	1 32	2 01	2 28	1 00	1 34	1 28	2 42
24	2 05	1 55	2 32	3 09	1 32	2 14	1 59	3 20
25	2 40	2 40	3 04	3 52	2 02	2 53	2 30	3 59
26	3 15	3 24	3 38	4 38	2 33	3 32	3 02	4 43
27	3 50	4 13	4 15	5 37	3 04	4 15	3 40	5 31
28	4 26	5 07	4 57	7 11	3 35	5 05	4 31	6 23
29	5 08	6 22	.. ..	.. ..	4 13	6 09	7 16	5 40
30	5 54	8 02	.. ..	.. ..	5 04	7 27	8 05	7 01
31	6 55	9 39	.. ..	.. ..	6 20	8 30	.. ..	.. ..

To reduce Sitka Standard Time to Sitka Local Time *subtract* 1 minute.

**Full-faced type** is used to designate noon to midnight.

*Sitka Standard Time—Nine hours slower than Greenwich Time.*

## SITKA, ALASKA. HIGH WATER, 1898.

Day of month.	May.		June.		July.		August.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	<b>8 52</b>	8 22	<b>9 34</b>	9 58	<b>10 01</b>	11 00	<b>11 53</b>	<b>12 25</b>
2	<b>9 36</b>	9 23	<b>10 23</b>	11 01	<b>10 58</b>	11 56	...	<b>1 03</b>
3	<b>10 19</b>	10 17	<b>11 12</b>	11 58	<b>11 53</b>	<b>12 44</b>	0 45	<b>1 38</b>
4	<b>10 59</b>	11 10	...	<b>12 49</b>	...	<b>1 26</b>	<b>2 13</b>	1 33
5	<b>11 37</b>	<b>12 00</b>	0 00	<b>1 37</b>	0 45	<b>2 07</b>	<b>2 48</b>	2 21
6	...	<b>12 48</b>	0 47	<b>2 23</b>	1 36	<b>2 46</b>	<b>3 26</b>	3 10
7	0 17	<b>1 37</b>	1 36	<b>3 09</b>	<b>3 27</b>	2 28	<b>4 05</b>	3 59
8	0 57	<b>2 26</b>	2 29	<b>3 56</b>	<b>4 09</b>	3 20	<b>4 45</b>	4 56
9	1 41	<b>3 17</b>	<b>4 45</b>	3 25	<b>4 52</b>	4 17	<b>5 32</b>	6 10
10	2 30	<b>4 11</b>	<b>5 36</b>	4 31	<b>5 38</b>	5 21	<b>6 30</b>	7 45
11	3 26	<b>5 11</b>	<b>6 28</b>	5 45	<b>6 29</b>	6 38	<b>7 39</b>	9 20
12	<b>6 14</b>	4 35	<b>7 22</b>	7 10	<b>7 25</b>	8 08	<b>8 46</b>	10 23
13	<b>7 13</b>	6 04	<b>8 15</b>	8 32	<b>8 22</b>	9 34	<b>9 45</b>	11 03
14	<b>8 11</b>	7 37	<b>9 06</b>	9 47	<b>9 19</b>	10 40	<b>10 35</b>	11 35
15	<b>9 03</b>	8 57	<b>9 53</b>	10 50	<b>10 07</b>	11 29	<b>11 18</b>	<b>12 02</b>
16	<b>9 49</b>	10 03	<b>10 35</b>	11 41	<b>10 54</b>	<b>12 08</b>	<b>11 56</b>	<b>12 24</b>
17	<b>10 30</b>	11 00	<b>11 17</b>	<b>12 25</b>	<b>11 36</b>	<b>12 41</b>	...	<b>12 48</b>
18	<b>11 10</b>	11 49	<b>11 58</b>	<b>1 04</b>	...	<b>1 10</b>	0 33	<b>1 18</b>
19	<b>11 47</b>	<b>12 35</b>	...	<b>1 40</b>	0 15	<b>1 34</b>	1 10	<b>1 39</b>
20	...	<b>1 17</b>	0 35	<b>2 09</b>	0 51	<b>1 58</b>	<b>2 17</b>	1 45
21	0 24	<b>1 56</b>	1 10	<b>2 36</b>	1 28	<b>2 24</b>	<b>2 41</b>	2 24
22	0 59	<b>2 31</b>	1 45	<b>3 05</b>	2 05	<b>2 52</b>	<b>3 15</b>	3 04
23	1 30	<b>3 04</b>	2 20	<b>3 36</b>	<b>3 21</b>	2 45	<b>3 55</b>	3 52
24	2 04	<b>3 39</b>	<b>4 08</b>	3 01	<b>3 53</b>	3 30	<b>4 45</b>	4 54
25	2 39	<b>4 14</b>	<b>4 42</b>	3 50	<b>4 35</b>	4 15	<b>5 50</b>	6 16
26	3 19	<b>4 51</b>	<b>5 19</b>	4 45	<b>5 23</b>	5 12	<b>7 15</b>	8 05
27	<b>5 32</b>	4 09	<b>6 06</b>	5 46	<b>6 20</b>	6 31	<b>8 41</b>	9 33
28	<b>6 16</b>	5 12	<b>7 02</b>	6 57	<b>7 30</b>	8 10	<b>9 55</b>	10 30
29	<b>7 00</b>	6 25	<b>8 01</b>	8 25	<b>8 44</b>	9 47	<b>10 57</b>	11 14
30	<b>7 52</b>	7 40	<b>9 02</b>	9 50	<b>9 53</b>	10 54	<b>11 52</b>	11 52
31	<b>8 44</b>	8 50	...	...	<b>10 56</b>	11 43	...	<b>12 30</b>

To reduce Sitka Standard Time to Sitka Local Time *subtract* 1 minute.**Full-faced type** is used to designate noon to midnight.

## TIDE TABLES.

*Sitka Standard Time—Nine hours slower than Greenwich Time.*

## SITKA, ALASKA. HIGH WATER, 1898.

Day of month.	September.		October.		November.		December.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	1 07	0 42	1 07	1 15	1 44	2 33	1 54	2 54
2	1 43	1 27	1 40	1 57	2 16	3 12	2 28	3 27
3	2 15	2 09	2 13	2 40	2 49	3 54	3 04	4 01
4	2 49	2 51	2 46	3 24	3 27	4 37	4 37	3 50
5	3 23	3 39	3 21	4 11	4 16	5 25	5 15	4 47
6	4 01	4 31	4 01	5 06	6 17	5 22	5 55	5 53
7	4 45	5 36	4 55	6 15	7 06	6 44	6 36	7 11
8	5 43	7 12	6 15	7 28	7 52	8 03	7 27	8 27
9	7 00	8 46	8 22	7 40	8 36	9 09	8 20	9 39
10	8 30	9 42	9 04	8 50	9 18	10 01	9 11	10 42
11	9 22	10 18	9 42	9 45	9 58	10 52	10 01	11 37
12	10 14	10 42	10 17	10 33	10 36	11 41	10 50	.. ..
13	10 58	11 08	10 49	11 14	11 15	.. ..	11 38	0 25
14	11 37	11 33	11 20	11 51	11 54	0 27	12 25	1 11
15	.. ..	12 02	11 51	.. ..	12 34	1 13	1 13	1 55
16	12 30	0 16	12 23	0 33	1 16	1 59	2 04	2 37
17	12 58	0 55	12 57	1 15	2 02	2 46	2 56	3 21
18	1 29	1 26	1 32	2 00	2 55	3 37	4 07	3 56
19	2 02	2 06	2 14	2 47	4 00	4 31	4 55	5 06
20	2 39	2 51	3 00	3 41	5 32	5 19	5 45	6 28
21	3 22	3 44	4 02	4 44	6 33	6 56	6 41	8 00
22	4 16	4 47	5 27	5 58	7 33	8 25	7 42	9 28
23	5 32	6 12	7 15	7 10	8 30	9 40	8 40	10 36
24	7 12	7 47	8 19	8 44	9 20	10 41	9 33	11 30
25	8 44	9 00	9 14	9 49	10 06	11 34	10 22	.. ..
26	9 58	9 52	10 00	10 46	10 49	.. ..	11 06	0 15
27	10 35	10 59	10 42	11 39	11 29	0 22	11 49	0 55
28	11 20	11 44	11 21	.. ..	12 08	1 05	12 28	1 30
29	11 59	.. ..	11 59	0 26	12 45	1 44	1 04	2 00
30	12 34	0 28	12 34	1 10	1 20	2 22	1 38	2 26
31	.. ..	.. ..	1 09	1 52	.. ..	.. ..	2 11	2 52

To reduce Sitka Standard Time to Sitka Local Time *subtract* 1 minute.**Full-faced type** is used to designate noon to midnight.

*Tahiti Standard Time—Ten hours slower than Greenwich Time.*

ST. PAUL, KADIAK ISLAND, ALASKA. HIGH WATER, 1898.

Day of month.	January.		February.		March.		April.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	7 30	<b>8 44</b>	8 29	<b>11 10</b>	6 18	<b>9 28</b>	8 21	<b>10 07</b>
2	8 25	<b>10 07</b>	9 31	<b>11 49</b>	7 33	<b>10 44</b>	<b>10 39</b>	9 39
3	9 17	<b>11 11</b>	10 26	.. ..	8 55	<b>11 13</b>	<b>11 09</b>	10 35
4	10 07	.. ..	11 14	0 17	10 02	<b>11 36</b>	<b>11 40</b>	11 22
5	10 51	0 00	<b>12 00</b>	0 43	10 57	.. ..	.. ..	<b>12 06</b>
6	11 33	0 38	<b>12 41</b>	1 09	11 42	0 00	0 11	<b>12 47</b>
7	<b>12 15</b>	1 10	<b>1 20</b>	1 35	<b>12 24</b>	0 27	0 45	<b>1 29</b>
8	<b>12 54</b>	1 40	<b>1 58</b>	2 03	<b>1 03</b>	0 55	1 20	<b>2 12</b>
9	<b>1 31</b>	2 09	<b>2 38</b>	2 32	<b>1 42</b>	1 24	1 57	<b>2 59</b>
10	<b>2 10</b>	2 39	3 02	<b>3 19</b>	1 55	<b>2 23</b>	2 38	<b>3 49</b>
11	<b>2 51</b>	3 10	3 36	<b>4 06</b>	2 29	<b>3 06</b>	3 24	<b>4 48</b>
12	3 42	<b>3 35</b>	4 15	<b>5 00</b>	3 04	<b>3 56</b>	4 17	<b>6 00</b>
13	4 15	<b>4 23</b>	5 02	<b>6 10</b>	3 45	<b>4 51</b>	5 25	<b>7 21</b>
14	4 55	<b>5 19</b>	6 00	<b>7 41</b>	4 33	<b>6 03</b>	6 48	<b>8 36</b>
15	5 40	<b>6 28</b>	7 12	<b>9 20</b>	5 36	<b>7 35</b>	<b>9 33</b>	8 18
16	6 35	<b>7 53</b>	8 31	<b>10 34</b>	6 56	<b>9 06</b>	<b>10 17</b>	9 37
17	7 39	<b>9 25</b>	9 47	<b>11 25</b>	8 25	<b>10 10</b>	<b>10 57</b>	10 40
18	8 47	<b>10 44</b>	10 52	.. ..	9 44	<b>10 55</b>	<b>11 33</b>	11 30
19	9 53	<b>11 42</b>	11 47	0 07	10 48	<b>11 35</b>	.. ..	<b>12 14</b>
20	10 54	.. ..	<b>12 35</b>	0 45	11 40	.. ..	0 08	<b>12 54</b>
21	11 50	0 30	<b>1 21</b>	1 21	<b>12 27</b>	0 12	0 43	<b>1 33</b>
22	<b>12 41</b>	1 11	1 56	<b>2 05</b>	0 47	<b>1 10</b>	1 17	<b>2 10</b>
23	<b>1 31</b>	1 50	2 30	<b>2 45</b>	1 20	<b>1 48</b>	1 50	<b>2 48</b>
24	<b>2 19</b>	2 29	3 00	<b>3 24</b>	1 52	<b>2 26</b>	2 21	<b>3 26</b>
25	<b>3 04</b>	3 06	3 33	<b>4 04</b>	2 23	<b>3 03</b>	2 51	<b>4 07</b>
26	3 42	<b>3 44</b>	4 06	<b>4 47</b>	2 53	<b>3 41</b>	3 24	<b>4 54</b>
27	4 18	<b>4 34</b>	4 42	<b>5 41</b>	3 22	<b>4 24</b>	4 01	<b>5 47</b>
28	4 57	<b>5 24</b>	5 22	<b>7 05</b>	3 54	<b>5 14</b>	4 52	<b>6 50</b>
29	5 39	<b>6 25</b>	.. ..	.. ..	4 30	<b>6 24</b>	6 10	<b>7 51</b>
30	6 27	<b>7 54</b>	.. ..	.. ..	5 20	<b>8 07</b>	<b>8 44</b>	7 40
31	7 24	<b>9 55</b>	.. ..	.. ..	6 47	<b>9 27</b>	.. ..	.. ..

To reduce Tahiti Standard Time to St. Paul Local Time *subtract* 9 minutes.

**Full-faced type** is used to designate noon to midnight.

## TIDE TABLES.

*Tahiti Standard Time—Ten hours slower than Greenwich Time.*

ST. PAUL, KADIAK ISLAND, ALASKA. HIGH WATER, 1898.

Day of month.	May.		June.		July.		August.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	<b>9 29</b>	9 02	<b>10 10</b>	10 35	<b>10 36</b>	11 24	.. ..	<b>12 47</b>
2	<b>10 11</b>	10 06	<b>10 59</b>	11 33	<b>11 31</b>	<b>12 19</b>	0 20	<b>1 27</b>
3	<b>10 52</b>	10 59	<b>11 47</b>	<b>12 25</b>	.. ..	<b>1 06</b>	1 10	<b>2 05</b>
4	<b>11 32</b>	11 47	.. ..	<b>1 14</b>	0 25	<b>1 50</b>	1 59	<b>2 42</b>
5	.. ..	<b>12 34</b>	0 35	<b>2 01</b>	1 16	<b>2 32</b>	2 45	<b>3 17</b>
6	0 12	<b>1 20</b>	1 22	<b>2 48</b>	2 07	<b>3 14</b>	<b>3 54</b>	3 29
7	0 53	<b>2 06</b>	2 12	<b>3 36</b>	2 57	<b>3 55</b>	<b>4 32</b>	4 14
8	1 35	<b>2 55</b>	3 04	<b>4 25</b>	<b>4 25</b>	3 47	<b>5 14</b>	5 04
9	2 21	<b>3 46</b>	4 00	<b>5 14</b>	<b>5 20</b>	4 40	<b>6 05</b>	6 04
10	3 11	<b>4 42</b>	<b>6 04</b>	5 03	<b>6 08</b>	5 40	<b>7 02</b>	7 27
11	4 09	<b>5 49</b>	<b>6 57</b>	6 14	<b>7 00</b>	6 46	<b>8 11</b>	9 30
12	5 18	<b>6 48</b>	<b>7 54</b>	7 30	<b>7 58</b>	8 10	<b>9 20</b>	10 53
13	<b>7 47</b>	6 40	<b>8 48</b>	8 49	<b>8 55</b>	9 41	<b>10 19</b>	11 38
14	<b>8 43</b>	8 06	<b>9 37</b>	10 01	<b>9 51</b>	10 57	<b>11 08</b>	<b>12 07</b>
15	<b>9 33</b>	9 20	<b>10 23</b>	11 01	<b>10 40</b>	11 49	<b>11 50</b>	<b>12 32</b>
16	<b>10 17</b>	10 21	<b>11 04</b>	11 54	<b>11 24</b>	<b>12 29</b>	.. ..	<b>12 56</b>
17	<b>10 57</b>	11 14	<b>11 44</b>	<b>12 36</b>	.. ..	<b>1 01</b>	0 31	<b>1 22</b>
18	<b>11 34</b>	<b>12 00</b>	.. ..	<b>1 15</b>	0 07	<b>1 30</b>	1 09	<b>1 48</b>
19	.. ..	<b>12 42</b>	0 23	<b>1 50</b>	0 47	<b>1 58</b>	1 44	<b>2 14</b>
20	0 11	<b>1 22</b>	1 02	<b>2 23</b>	1 23	<b>2 26</b>	<b>2 41</b>	2 21
21	0 47	<b>2 01</b>	1 37	<b>2 55</b>	2 00	<b>2 54</b>	<b>3 12</b>	2 59
22	1 22	<b>2 38</b>	2 12	<b>3 27</b>	2 37	<b>3 21</b>	<b>3 48</b>	3 41
23	1 55	<b>3 14</b>	2 50	<b>3 59</b>	<b>3 51</b>	3 16	<b>4 30</b>	4 30
24	2 29	<b>3 52</b>	3 31	<b>4 33</b>	<b>4 26</b>	3 59	<b>5 21</b>	5 32
25	3 03	<b>4 30</b>	<b>5 10</b>	4 18	<b>5 08</b>	4 47	<b>6 29</b>	6 55
26	3 43	<b>5 11</b>	<b>5 53</b>	5 13	<b>5 57</b>	5 49	<b>7 51</b>	8 34
27	4 34	<b>5 57</b>	<b>6 42</b>	6 17	<b>6 58</b>	7 07	<b>9 13</b>	10 00
28	<b>6 46</b>	5 39	<b>7 37</b>	7 35	<b>8 08</b>	8 43	<b>10 24</b>	10 56
29	<b>7 36</b>	6 57	<b>8 37</b>	9 00	<b>9 20</b>	10 12	<b>11 24</b>	11 40
30	<b>8 28</b>	8 17	<b>9 38</b>	10 20	<b>10 28</b>	11 17	.. ..	<b>12 20</b>
31	<b>9 19</b>	9 30	.. ..	.. ..	<b>11 26</b>	<b>12 05</b>	0 15	<b>12 57</b>

To reduce Tahiti Standard Time to St. Paul Local Time *subtract* 9 minutes.

**Full-faced type** is used to designate noon to midnight.

*Tahiti Standard Time—Ten hours slower than Greenwich Time.*

ST. PAUL, KADIAK ISLAND, ALASKA. HIGH WATER, 1898.

Day of month.	September.		October.		November.		December.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	1 02	1 32	1 31	1 32	2 10	2 40	2 22	3 07
2	2 07	1 48	2 05	2 12	2 42	3 20	2 57	3 44
3	2 39	2 29	2 38	2 51	3 18	4 02	3 37	4 21
4	3 12	3 09	3 10	3 31	3 56	4 48	4 20	4 58
5	3 48	3 50	3 45	4 16	4 42	5 38	5 37	5 15
6	4 25	4 35	4 23	5 07	5 50	6 33	6 20	6 23
7	5 03	5 29	5 14	6 16	7 28	7 14	7 07	7 40
8	6 03	6 50	6 33	7 48	8 18	8 36	7 57	8 58
9	7 19	9 00	8 10	9 07	9 03	9 43	8 49	10 09
10	8 44	10 25	9 27	8 49	9 45	10 39	9 41	11 10
11	9 54	11 00	10 20	10 24	10 27	11 27	10 32	.. ..
12	10 48	11 24	10 50	11 10	11 08	.. ..	11 23	0 04
13	11 33	11 47	11 20	11 50	11 49	0 14	12 12	0 54
14	.. ..	12 11	11 52	.. ..	12 30	1 00	1 01	1 40
15	12 38	0 12	12 24	0 30	1 13	1 46	1 50	2 25
16	1 05	0 50	12 59	1 10	1 58	2 33	2 41	3 10
17	1 35	1 27	1 35	1 54	2 46	3 22	3 35	3 57
18	2 06	2 05	2 14	2 39	3 41	4 15	4 34	4 44
19	2 41	2 45	2 57	3 26	4 45	5 11	5 31	5 39
20	3 1	3 30	3 49	4 20	6 09	6 00	6 22	6 52
21	4 03	4 22	4 51	5 25	7 07	7 23	7 17	8 11
22	5 00	5 26	6 10	6 38	8 04	8 44	8 13	9 31
23	6 14	6 49	7 39	7 51	8 59	9 52	9 08	10 39
24	7 43	8 21	8 53	9 03	9 48	10 51	10 00	11 36
25	9 09	9 33	9 42	10 12	10 31	11 42	10 48	.. ..
26	10 20	10 25	10 26	11 06	11 14	.. ..	11 31	0 24
27	11 18	11 08	11 07	11 54	11 53	0 28	12 13	1 05
28	.. ..	11 47	11 45	.. ..	12 32	1 11	12 53	1 40
29	12 22	0 08	12 22	0 38	1 10	1 51	1 30	2 13
30	12 57	0 51	12 59	1 19	1 47	2 29	2 05	2 45
31	.. ..	.. ..	1 35	2 00	.. ..	.. ..	2 41	3 16

To reduce Tahiti Standard Time to St. Paul Local Time *subtract* 9 minutes.

**Full-faced type** is used to designate noon to midnight.

## TIDE TABLES.

*Hawaiian Standard Time—Ten hours and thirty minutes slower than Greenwich Time.*

## HONOLULU, H. I. HIGH WATER, 1898.

Day of month.	January.		February.		March.		April.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
1	h m 10 27	h m .. ..	h m 0 40	h m 12 40	h m 11 53	h m 11 10	h m .. ..	h m 1 05
2	0 33	12 01	1 21	1 50	.. ..	12 54	0 24	1 37
3	1 15	1 10	1 57	2 34	0 36	1 42	1 11	2 06
4	1 52	2 02	2 28	3 04	1 15	2 09	2 35	1 54
5	2 27	2 42	3 00	3 37	1 50	2 39	3 12	2 31
6	2 59	3 21	3 30	4 12	2 23	3 11	3 50	3 07
7	3 26	3 59	3 59	4 47	2 56	3 43	4 30	3 43
8	3 58	4 35	4 34	5 22	3 35	4 16	5 13	4 20
9	4 29	5 15	5 09	6 04	4 54	4 10	6 02	4 58
10	5 00	5 57	6 57	5 47	5 36	4 45	6 56	5 45
11	5 34	6 43	7 55	6 26	6 26	5 20	8 00	6 49
12	6 14	7 32	9 04	7 07	7 24	5 58	9 09	8 43
13	6 52	8 33	10 16	8 06	8 30	6 45	10 19	10 39
14	9 40	7 44	11 25	9 51	9 45	8 10	11 23	11 55
15	10 47	8 38	.. ..	11 46	10 58	10 33	.. ..	12 46
16	11 50	9 57	0 27	1 02	.. ..	12 03	0 19	1 29
17	.. ..	11 28	1 19	1 58	0 00	1 03	2 04	1 15
18	0 48	12 47	2 07	2 42	0 54	1 48	2 41	2 00
19	1 39	1 55	2 48	3 24	1 40	2 28	3 20	2 36
20	2 25	2 48	3 24	4 04	2 20	3 06	3 56	3 10
21	3 07	3 35	4 00	4 45	3 38	3 04	4 34	3 40
22	3 47	4 20	4 35	5 20	4 17	3 40	5 07	4 09
23	4 24	5 06	6 05	5 06	4 55	4 08	5 44	4 38
24	4 59	5 52	6 54	5 30	5 36	4 34	6 19	5 06
25	5 34	6 39	7 48	5 48	6 00	4 57	7 00	6 10
26	6 06	7 34	8 50	6 04	7 01	5 13	7 43	7 40
27	8 40	6 34	9 57	6 55	7 52	6 00	8 35	9 30
28	9 52	7 05	11 01	8 50	8 48	7 45	9 32	10 51
29	10 59	8 00	.. ..	.. ..	9 49	10 10	10 31	11 46
30	11 53	9 30	.. ..	.. ..	10 46	11 45	11 34	12 22
31	.. ..	11 10	.. ..	.. ..	11 38	12 38	.. ..	.. ..

To reduce Hawaiian Standard Time to Honolulu Local Time *subtract* 1 minute.

**Full-faced type** is used to designate noon to midnight.

*Hawaiian Standard Time—Ten hours and thirty minutes slower than Greenwich Time.*

## HONOLULU, H. I. HIGH WATER, 1898.

Day of month.	May.		June.		July.		August.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	12 53	.. ..	1 49	0 40	2 16	1 21	3 25	3 13
2	1 31	0 27	2 31	1 32	3 00	2 21	4 02	3 57
3	2 10	1 14	3 15	2 24	3 44	3 15	4 37	4 41
4	2 50	1 59	3 58	3 13	4 24	4 06	5 11	5 27
5	3 31	2 41	4 41	4 04	5 04	4 57	5 47	6 13
6	4 12	3 21	5 24	4 56	5 40	5 51	7 01	6 20
7	4 55	4 04	6 08	5 59	6 15	6 46	8 07	7 10
8	5 44	4 50	6 54	7 09	6 57	7 45	9 16	8 30
9	6 33	5 52	7 40	8 28	7 39	8 50	10 27	10 08
10	7 29	7 09	8 40	9 45	10 05	8 30	11 32	11 46
11	8 26	8 52	10 50	9 48	11 15	9 53	12 25	.. ..
12	9 30	10 23	11 50	10 58	12 11	11 29	1 09	1 07
13	10 37	11 30	12 40	.. ..	12 58	.. ..	1 46	1 58
14	12 20	11 50	1 24	0 07	1 39	1 04	2 15	2 32
15	1 03	.. ..	2 04	1 07	2 15	2 01	2 45	3 00
16	1 44	0 42	2 40	1 58	2 47	2 42	3 12	3 29
17	2 23	1 29	3 14	2 41	3 16	3 19	3 42	3 59
18	3 00	2 11	3 45	3 21	3 45	3 52	4 16	4 29
19	3 35	2 50	4 15	4 01	4 12	4 26	4 51	5 02
20	4 10	3 24	4 44	4 41	4 42	5 02	5 43	5 26
21	4 42	3 59	5 12	5 24	5 14	5 40	6 28	6 02
22	5 12	4 36	5 44	6 08	5 49	6 20	7 20	6 38
23	5 45	5 25	6 20	6 57	6 27	7 05	8 23	7 28
24	6 20	6 16	7 01	7 48	7 12	8 01	9 36	8 45
25	6 56	7 28	7 44	8 44	9 03	7 59	10 49	10 50
26	7 42	8 45	9 49	8 42	10 11	9 05	11 54	.. ..
27	8 34	9 51	10 50	9 47	11 19	10 42	12 50	0 33
28	9 34	10 41	11 48	11 02	12 18	.. ..	1 40	1 32
29	11 31	10 36	12 41	.. ..	1 11	0 19	2 22	2 20
30	12 19	11 41	1 20	0 16	2 00	1 30	3 01	3 01
31	1 05	.. ..	.. ..	.. ..	2 44	2 25	3 40	3 40

To reduce Hawaiian Standard Time to Honolulu Local Time *subtract* 1 minute.

**Full-faced type** is used to designate noon to midnight.

*Hawaiian Standard Time—Ten hours and thirty minutes slower than Greenwich Time.*

HONOLULU, H. I. HIGH WATER, 1898.

Day of month.	September.		October.		November.		December.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	4 19	<b>4 18</b>	4 36	<b>4 21</b>	5 27	<b>5 32</b>	5 31	<b>6 15</b>
2	4 56	<b>4 50</b>	5 18	<b>4 55</b>	6 05	<b>6 24</b>	6 03	<b>7 18</b>
3	5 42	<b>5 16</b>	5 57	<b>5 45</b>	6 45	<b>8 00</b>	6 38	<b>8 23</b>
4	6 29	<b>5 38</b>	6 41	<b>6 55</b>	7 24	<b>9 25</b>	7 17	<b>9 27</b>
5	7 22	<b>6 25</b>	7 30	<b>8 25</b>	8 10	<b>10 40</b>	8 05	<b>10 17</b>
6	8 22	<b>7 30</b>	8 23	<b>9 54</b>	9 00	<b>11 34</b>	<b>11 10</b>	8 54
7	9 29	<b>9 46</b>	9 24	<b>11 20</b>	10 01	.. ..	.. ..	9 58
8	10 39	<b>11 48</b>	10 21	.. ..	11 06	0 07	0 00	11 06
9	11 34	.. ..	11 13	0 14	0 39	11 58	0 48	<b>12 10</b>
10	<b>12 20</b>	0 59	<b>12 00</b>	0 52	1 16	<b>12 49</b>	1 30	<b>1 09</b>
11	<b>1 02</b>	1 42	<b>12 49</b>	1 28	1 55	<b>1 36</b>	2 13	<b>2 03</b>
12	<b>1 34</b>	2 09	1 51	<b>1 34</b>	2 32	<b>2 19</b>	2 54	<b>2 54</b>
13	<b>2 05</b>	2 33	2 22	<b>2 09</b>	3 11	<b>3 01</b>	3 36	<b>3 44</b>
14	<b>2 42</b>	2 57	2 56	<b>2 47</b>	3 51	<b>3 45</b>	4 18	<b>4 26</b>
15	<b>3 18</b>	3 24	3 32	<b>3 24</b>	4 32	<b>4 30</b>	5 00	<b>5 22</b>
16	3 57	<b>3 51</b>	4 10	<b>4 00</b>	5 17	<b>5 28</b>	5 42	<b>6 26</b>
17	4 33	<b>4 24</b>	4 51	<b>4 38</b>	6 04	<b>6 40</b>	6 26	<b>7 43</b>
18	5 12	<b>4 59</b>	5 37	<b>5 21</b>	6 55	<b>8 05</b>	7 08	<b>8 58</b>
19	5 59	<b>5 34</b>	6 26	<b>6 19</b>	7 50	<b>9 35</b>	8 06	<b>10 04</b>
20	6 51	<b>6 20</b>	7 24	<b>7 56</b>	8 48	<b>10 46</b>	<b>11 10</b>	9 04
21	7 51	<b>7 25</b>	8 29	<b>9 50</b>	9 54	<b>11 43</b>	.. ..	10 21
22	9 01	<b>9 39</b>	9 35	<b>11 16</b>	11 10	.. ..	0 10	11 39
23	10 12	<b>11 26</b>	10 43	.. ..	0 33	<b>12 10</b>	1 01	<b>12 48</b>
24	11 22	.. ..	11 44	0 15	1 20	<b>1 07</b>	1 46	<b>1 46</b>
25	<b>12 22</b>	0 32	1 00	<b>12 46</b>	2 02	<b>1 55</b>	2 25	<b>2 37</b>
26	<b>1 11</b>	1 21	1 39	<b>1 33</b>	2 42	<b>2 38</b>	3 02	<b>3 20</b>
27	<b>1 55</b>	2 04	2 20	<b>2 16</b>	3 21	<b>3 17</b>	3 35	<b>3 59</b>
28	<b>2 44</b>	2 40	3 00	<b>2 54</b>	3 57	<b>3 56</b>	4 04	<b>4 35</b>
29	3 16	<b>3 19</b>	3 39	<b>3 28</b>	4 30	<b>4 36</b>	4 31	<b>5 11</b>
30	3 56	<b>3 51</b>	4 16	<b>4 00</b>	5 01	<b>5 22</b>	4 59	<b>5 55</b>
31	.. ..	.. ..	4 51	<b>4 34</b>	.. ..	.. ..	5 27	<b>6 39</b>

To reduce Hawaiian Standard Time to Honolulu Local Time *subtract* 1 minute.

**Full-faced type** is used to designate noon to midnight.

*Panama Mean Time—Five hours and eighteen minutes slower than Greenwich Time.*

PANAMA, COLOMBIA. HIGH WATER, 1898.

Day of month.	January.		February.		March.		April.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	10 26	10 00	11 37	11 20	9 25	9 45	11 49	11 09
2	11 24	11 01	.. ..	12 25	10 30	10 48	11 54	.. ..
3	.. ..	12 08	0 37	1 22	11 58	11 41	12 51	0 16
4	0 20	1 00	2 10	1 31	.. ..	12 45	1 39	1 13
5	1 11	1 51	2 50	2 18	1 35	0 58	2 22	2 00
6	1 59	2 35	3 29	3 00	2 19	1 49	3 04	2 45
7	3 15	2 42	4 04	3 39	2 58	2 33	3 44	3 27
8	3 54	3 22	4 40	4 18	3 35	3 14	4 25	4 09
9	4 30	4 01	5 16	4 55	4 12	3 53	5 07	4 51
10	5 06	4 40	5 53	5 31	4 49	4 32	5 52	5 35
11	5 42	5 15	6 31	6 11	5 18	5 11	6 22	6 39
12	6 19	5 52	7 15	6 53	6 02	5 51	7 14	7 32
13	6 57	6 32	8 04	7 40	6 53	6 35	8 12	8 35
14	7 40	7 14	9 01	8 34	7 24	7 45	9 18	9 48
15	8 29	8 01	10 11	9 41	8 20	8 46	10 31	11 02
16	9 26	8 56	11 30	11 00	9 29	9 59	11 41	.. ..
17	10 33	10 01	.. ..	12 19	11 18	10 45	12 43	0 14
18	11 46	11 17	1 28	0 45	.. ..	12 03	1 36	1 14
19	.. ..	12 33	2 25	1 50	1 09	0 33	2 24	2 04
20	0 56	1 42	3 15	2 46	2 04	1 35	3 07	2 50
21	2 40	2 01	4 00	3 35	2 51	2 29	3 49	3 32
22	3 32	3 00	4 43	4 20	3 35	3 15	4 27	4 12
23	4 21	3 51	5 24	5 03	4 16	3 58	4 51	5 04
24	5 06	4 40	6 04	5 44	4 55	4 38	5 29	5 40
25	5 50	5 25	6 44	6 24	5 33	5 17	6 06	6 14
26	6 34	6 09	7 05	7 22	5 55	6 10	6 44	6 49
27	7 17	6 53	7 46	8 04	6 33	6 46	7 23	7 27
28	8 01	7 37	8 32	8 50	7 12	7 24	8 07	8 11
29	8 48	8 24	.. ..	.. ..	7 54	8 03	8 57	9 05
30	9 39	9 15	.. ..	.. ..	8 42	8 52	9 55	10 16
31	10 33	10 14	.. ..	.. ..	9 40	9 56	.. ..	.. ..

Full-faced type is used to designate noon to midnight.

## TIDE TABLES.

*Panama Mean Time—Five hours and eighteen minutes slower than Greenwich Time.*

## PANAMA, COLOMBIA. HIGH WATER, 1898.

Day of month.	May.		June.		July.		August.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	11 00	11 26	12 10	.. ..	12 41	0 18	2 32	2 12
2	12 00	.. ..	1 10	0 49	1 45	1 25	3 26	3 07
3	12 54	0 29	2 05	1 48	2 43	2 26	4 15	3 56
4	1 44	1 24	2 59	2 42	3 37	3 21	4 43	5 02
5	2 32	2 15	3 50	3 34	4 29	4 11	5 27	5 47
6	3 19	3 03	4 39	4 24	5 00	5 19	6 11	6 31
7	4 04	3 50	5 13	5 29	5 48	6 06	6 55	7 16
8	4 51	4 36	6 02	6 20	6 35	6 55	7 39	8 03
9	5 24	5 38	6 54	7 12	7 22	7 44	8 26	8 54
10	6 12	6 29	7 46	8 09	8 11	8 36	9 18	9 52
11	7 05	7 25	8 41	9 06	9 04	9 32	10 16	11 00
12	8 02	8 25	9 39	10 10	10 00	10 34	11 20	.. ..
13	9 03	9 31	10 38	11 12	11 00	11 39	12 24	0 08
14	10 08	10 40	11 36	.. ..	11 59	.. ..	1 19	1 09
15	11 12	11 46	12 33	0 14	12 55	0 41	2 07	1 58
16	12 12	.. ..	1 25	1 10	1 46	1 37	2 50	2 40
17	1 06	0 46	2 11	2 00	2 31	2 24	3 28	3 16
18	1 54	1 39	2 55	2 46	3 14	3 05	3 51	4 04
19	2 40	2 25	3 35	3 27	3 52	3 44	4 25	4 40
20	3 21	3 09	4 14	4 06	4 20	4 28	4 59	5 15
21	4 00	3 50	4 44	4 50	4 55	5 04	5 34	5 51
22	4 28	4 37	5 20	5 26	5 29	5 38	6 09	6 30
23	5 05	5 14	5 55	6 00	6 02	6 15	6 49	7 12
24	5 42	5 48	6 30	6 36	6 37	6 52	7 32	8 01
25	6 18	6 23	7 07	7 18	7 15	7 35	8 25	9 01
26	6 56	7 00	7 46	8 01	7 59	8 24	9 30	10 16
27	7 36	7 42	8 31	8 53	8 50	9 22	10 48	11 37
28	8 20	8 33	9 24	9 54	9 52	10 34	12 08	.. ..
29	9 09	9 31	10 25	11 04	11 05	11 54	1 20	0 53
30	10 07	10 36	11 32	.. ..	12 21	.. ..	2 19	1 55
31	11 08	11 44	.. ..	.. ..	1 30	1 08	3 11	2 49

**Full-faced type** is used to designate noon to midnight.

## TIDE TABLES.

63

*Panama Mean Time—Five hours and eighteen minutes slower than Greenwich Time.*

## PANAMA, COLOMBIA. HIGH WATER, 1898.

Day of month.	September.		October.		November.		December.	
	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.	Large tide.	Small tide.
	h m	h m	h m	h m	h m	h m	h m	h m
1	3 36	<b>3 58</b>	3 54	<b>4 18</b>	4 49	<b>5 16</b>	5 04	<b>5 34</b>
2	4 20	<b>4 41</b>	4 36	<b>5 00</b>	5 28	<b>5 56</b>	<b>6 11</b>	5 41
3	5 02	<b>5 24</b>	5 16	<b>5 40</b>	6 05	<b>6 35</b>	<b>6 48</b>	6 16
4	5 43	<b>6 05</b>	5 55	<b>6 20</b>	6 43	<b>7 16</b>	<b>7 27</b>	6 52
5	6 24	<b>6 47</b>	6 34	<b>7 02</b>	<b>8 00</b>	7 22	<b>8 06</b>	7 32
6	7 06	<b>7 30</b>	7 15	<b>7 45</b>	<b>8 47</b>	8 05	<b>8 50</b>	8 17
7	7 49	<b>8 18</b>	7 56	<b>8 35</b>	<b>9 40</b>	8 57	<b>9 41</b>	9 07
8	8 37	<b>9 12</b>	<b>9 30</b>	8 46	<b>10 39</b>	9 59	<b>10 39</b>	10 06
9	9 31	<b>10 16</b>	<b>10 35</b>	9 46	<b>11 35</b>	11 02	<b>11 39</b>	11 12
10	10 35	<b>11 27</b>	<b>11 38</b>	10 54	.. ..	<b>12 05</b>	.. ..	<b>12 18</b>
11	11 45	.. ..	.. ..	<b>12 00</b>	0 30	<b>1 00</b>	0 40	<b>1 19</b>
12	<b>12 47</b>	0 31	0 34	<b>12 55</b>	1 20	<b>1 51</b>	1 38	<b>2 16</b>
13	<b>1 38</b>	1 22	1 20	<b>1 43</b>	2 09	<b>2 40</b>	2 32	<b>3 10</b>
14	<b>2 20</b>	2 05	<b>2 25</b>	2 02	2 55	<b>3 26</b>	3 25	<b>4 00</b>
15	<b>2 59</b>	2 43	<b>3 07</b>	2 44	3 41	<b>4 12</b>	<b>4 49</b>	4 15
16	<b>3 37</b>	3 19	3 24	<b>3 49</b>	4 27	<b>5 00</b>	<b>5 37</b>	5 05
17	<b>4 14</b>	3 54	4 03	<b>4 30</b>	5 14	<b>5 48</b>	<b>6 27</b>	5 55
18	4 30	<b>4 51</b>	4 44	<b>5 12</b>	6 03	<b>6 38</b>	<b>7 18</b>	6 45
19	5 06	<b>5 30</b>	5 26	<b>5 57</b>	<b>7 31</b>	6 55	<b>8 10</b>	7 39
20	5 45	<b>6 10</b>	6 12	<b>6 46</b>	<b>8 30</b>	7 52	<b>9 05</b>	8 34
21	6 28	<b>6 56</b>	7 02	<b>7 40</b>	<b>9 31</b>	8 55	<b>10 04</b>	9 34
22	7 14	<b>7 48</b>	8 00	<b>8 43</b>	<b>10 35</b>	10 01	<b>11 05</b>	10 38
23	8 10	<b>8 50</b>	<b>9 51</b>	9 09	<b>11 38</b>	11 10	.. ..	11 42
24	9 17	<b>10 04</b>	<b>11 02</b>	10 23	.. ..	<b>12 14</b>	0 04	<b>12 44</b>
25	<b>11 22</b>	10 36	.. ..	11 35	0 35	<b>1 11</b>	1 00	<b>1 40</b>
26	.. ..	11 55	0 09	<b>12 41</b>	1 29	<b>2 02</b>	1 52	<b>2 29</b>
27	<b>1 03</b>	0 34	1 07	<b>1 37</b>	2 18	<b>2 50</b>	2 41	<b>3 14</b>
28	<b>2 01</b>	1 34	1 58	<b>2 26</b>	3 03	<b>3 34</b>	3 24	<b>3 55</b>
29	2 25	<b>2 51</b>	2 44	<b>3 12</b>	3 46	<b>4 15</b>	<b>4 33</b>	4 04
30	3 11	<b>3 36</b>	3 28	<b>3 55</b>	4 26	<b>4 55</b>	<b>5 10</b>	4 41
31	.. ..	.. ..	4 09	<b>4 36</b>	.. ..	.. ..	<b>5 45</b>	5 17

**Full-faced type** is used to designate noon to midnight.

## TIDAL CONSTANTS.

*Pacific Standard Time—Eight hours slower than Greenwich Time.*

Name of place.	High water. Correction.	Name of place.	High water. Correction.
SAN DIEGO, CAL.		SAN DIEGO, CAL.—Continued.	
MEXICO.		CALIFORNIA—continued.	
<i>Western Coast.</i>		<i>Outer Coast.</i>	
	<i>h m</i>		<i>h m</i>
San Blas .....	— 1 40	Lompoc Landing .....	+ 0 30
Mazatlan .....	— 52	Point Sal .....	+ 0 38
<i>Gulf of California.</i>		San Luis Obispo .....	+ 0 53
Altata, Culiacan River .....	— 0 09	Morro Bay .....	+ 1 07
San Lorenzo Channel .....	— 0 32	San Simeon Bay .....	+ 1 17
La Paz Harbor .....	— 0 27	SAN FRANCISCO, CAL.	
San Lucas Bay .....	+ 1 16	CALIFORNIA.	
Guaymas Harbor .....	+ 1 25	<i>Outer Coast.</i>	
Santa Teresa Bay .....	+ 1 53	Monterey Harbor Light .....	— 1 01
Puerto Refugio .....	+ 2 56	Santa Cruz Harbor Light .....	— 0 49
Tepoca Bay .....	+ 3 48	Half Moon Bay .....	— 0 53
Colorado River entrance .....	+ 4 52	S. E. Farallon Light .....	— 0 59
LOWER CALIFORNIA.		San Francisco Bar .....	— 0 01
San José del Cabo .....	— 1 31	<i>Bay of San Francisco.</i>	
Magdalena Bay .....	— 1 41	San Francisco entrance, Fort Point .....	0 00
San Bartolomé Bay .....	— 0 48	Sausalito .....	+ 0 03
Cerros Island .....	— 0 41	Mission-Street Wharf, San Francisco .....	+ 0 24
Playa Maria Bay .....	— 0 34	Oakland .....	+ 0 29
Rosario Bay .....	— 0 25	Guano Island .....	+ 0 46
San Quentin Bay .....	— 0 20	Ravenswood .....	+ 0 55
Colnett Bay .....	— 0 15	The Brothers Light .....	+ 0 59
Ensenada, Todos Santos Bay .....	— 0 11	<i>San Pablo Bay.</i>	
CALIFORNIA.		Point Wilson .....	+ 1 38
<i>Outer Coast.</i>		Petaluma Creek entrance .....	+ 1 08
San Diego Bar .....	— 0 03	Sonoma Creek entrance .....	+ 1 20
San Juan Capistrano .....	+ 0 06	<i>Karquines Strait.</i>	
<i>San Pedro Channel.</i>		Mare Island Light .....	+ 1 44
Newport Landing .....	+ 0 10	Wheatport .....	+ 1 53
Anaheim Landing .....	+ 0 08	Benicia .....	+ 2 18
San Pedro .....	+ 0 02	<i>Suisun Bay.</i>	
Santa Monica .....	+ 0 04	Seal Bluff .....	+ 2 25
<i>Santa Barbara Channel.</i>		Suisun Creek entrance .....	+ 2 37
Hueneme Light .....	+ 0 02	<i>San Joaquin River.</i>	
San Buenaventura .....	+ 0 23	Antioch .....	+ 3 52
Santa Barbara Light .....	+ 0 09	<i>Sacramento River.</i>	
Gaviota .....	+ 0 08	Collinsville .....	+ 3 19
<i>Santa Barbara Islands.</i>		Sacramento (capital) .....	+ 8 01
Catalina Har., Santa Catalina Is'd .....	+ 0 57		
Corral Har., San Nicolas Island .....	— 0 09		
Prisoner Har., Santa Cruz Island .....	— 0 01		
Cuyler Har., San Miguel Island .....	— 0 03		

## TIDAL CONSTANTS.

*Pacific Standard Time—Eight hours slower than Greenwich Time.*

Name of place.		High water.	Name of place.		High water.
		Correction.			Correction.
SAN FRANCISCO, CAL.—Cont'd.			ASTORIA, OREGON—Continued.		
CALIFORNIA—continued.			OREGON—continued.		
Outer Coast.			Outer Coast.		
		<i>h m</i>			<i>h m</i>
Drakes Bay .....	— 0	06	Siulaw River entrance.....	— 0	34
Point Reyes Light.....	— 0	16	Alseya Harbor entrance.....	— 0	42
Tomales Bay .....	+ 0	21	Yaquina Bay and River.		
Bodega Bay .....	— 0	20			
Fort Ross .....	— 0	33	Bar at entrance.....	— 0	53
Point Arena Light.....	— 1	00	Newport .....	— 0	49
Navarro River entrance.....	— 0	57	Yaquina City.....	— 0	36
Little River Harbor .....	— 1	06	Oysterville .....	— 0	23
Mendocino Bay.....	— 1	01	Outer Coast.		
Fort Bragg Landing.....	— 0	36	Nestuggah Bay .....	— 0	31
Westport.....	— 0	36	Tillamook Bay .....	— 0	40
Shelter Cove .....	— 0	45	OREGON AND WASHINGTON.		
Cape Mendocino Bay .....	— 0	33	Columbia River.		
ASTORIA, OREGON.			Columbia River Bar .....		
CALIFORNIA.			Point Adams (Clatsop).....		
Outer Coast.			Cape Disappointment.....		
Eel River Bar .....	— 1	32	Skeppernawin Creek .....		
Humboldt Bay.			Tongue Point .....		
			Marsh Island Creek.....		
Humboldt Bay Bar .....	— 1	09	Three Tree Point .....		
Red Bluff .....	— 1	03	Cathlamet.....		
Eureka.....	— 0	45	Eagle Cliff .....		
Outer Coast.			Oak Point .....		
Trinidad Harbor Light .....	— 1	15	Rinearson .....		
Crescent City Light .....	— 1	09	Ranier .....		
OREGON.			Kalama .....		
Outer Coast.			St. Helens Bar.....		
Chetko Cove .....	— 1	01	Willamette River entrance.....		
Rogue River .....	— 0	59	Vancouver, Old Fort .....		
Port Orford .....	— 1	09	WASHINGTON.		
Bandon, Coquille River.....	— 1	09	Willapa Bay.		
Coos Bay.			Bar at entrance .....		
			South Bend .....		
Coos Bay Bar.....	— 0	47	Oysterville .....		
Empire City.....	— 0	04	Sealand .....		
North Bend .....	+ 0	36	Grays Harbor.		
Marshfield.....	+ 1	47	Bar at entrance .....		
Umpqua River.			Hoquiam .....		
			Laidlaw .....		
Bar at entrance .....	— 0	12	Outer Coast.		
Gardiner .....	+ 0	18	Destruction Island .....		
			Quillihute River.....		
			Cape Alava.....		
			Cape Flattery Light.....		
			Nee-ah Bay.....		

## TIDAL CONSTANTS.

*Pacific Standard Time—Eight hours slower than Greenwich Time.*

Name of place.	High water.		Name of place.	High water.	
	Correction.			Correction.	
ASTORIA, OREGON—Continued.			PORT TOWNSEND, WASH.—Continued.		
Vancouver Island (outer coast).			WASHINGTON AND B. C.—cont'd.		
	<i>h</i>	<i>m</i>		<i>h</i>	<i>m</i>
Port San Juan.....	+ 0	29	Possession Sound and Washington Sound—Continued.		
Carmanah Point Light.....	+ 0	05	La Conner Post Light .....	+ 0	29
Cape Beale Light.....	— 0	18	Deception Pass .....	+ 0	09
Stamp Harbor.....	+ 0	30	Burrows Bay .....	+ 0	08
Clayoquot Sound.....	— 0	20	Anacortes .....	+ 0	29
Hesquiat Harbor .....	— 0	28	Eagle Harbor .....	+ 0	35
Nootka Sound.....	— 0	27			
Esperanza Inlet.....	— 0	36	Bellingham Bay.		
Kyuquot Sound.....	— 0	40	Samish Island .....	+ 0	39
Ou-On Kinsh Inlet.....	— 0	42	Chuckanut.....	+ 0	49
Klaaskino Inlet.....	— 0	52	Fairhaven.....	+ 0	51
Quatsino Sound entrance.....	— 0	51			
PORT TOWNSEND, WASH.			Lummi Bay.		
WASHINGTON AND B. C.			Point Migley.....	+ 0	55
Strait of Fuca.			Sandy Point.....	+ 0	58
Jordan River entrance.....	— 2	40			
Pysht River entrance.....	— 2	33	San Juan Channel.		
Sooke Inlet.....	— 2	24	Green Point, Spieden Island .....	— 0	11
Race Rocks Light .....	— 2	07	South Entrance .....	— 0	26
Esquimault Harbor.....	— 1	22	Roche Harbor .....	— 0	18
Victoria Harbor.....	— 1	02			
Discovery Island Light.....	— 0	53	Rosario Strait.		
Port Angeles .....	— 2	01	Peavine Pass .....	+ 0	33
New Dungeness Light.....	— 1	12	Strawberry Bay .....	+ 0	25
Washington Harbor .....	— 0	48	Thatcher Pass .....	+ 0	30
Port Discovery.....	— 0	36			
Smith Island Light.....	— 0	10	Padilla Bay.		
Puget Sound.			Bayview .....	+ 0	54
Point No Point Light.....	+ 0	11	Hat Island .....	+ 0	34
Port Madison.....	+ 0	25			
West Point Light .....	+ 0	26	Canal de Haro.		
Seattle.....	+ 0	27	Kanaka Bay.....	— 0	24
Port Blakely .....	+ 0	29	Stuart Island Turn Point .....	— 0	02
Port Orchard (Naval Station).....	+ 0	29	Patos Island.....	+ 0	23
Tacoma.....	+ 0	36			
Steilacoom .....	+ 0	50	Gulf of Georgia.		
Dofflemyer Point.....	+ 0	57	Active Pass .....	+ 1	12
Olympia, Capital.....	+ 1	01	Drayton Harbor .....	+ 1	04
Hood Canal.			North Sand Head Light.....	+ 1	18
Port Ludlow .....	+ 0	05	Atkinson Point Light.....	+ 1	27
Port Gamble.....	+ 0	07	Vancouver, Burrard Inlet.....	+ 1	35
Seabeck.....	+ 0	39	Nanaimo .....	+ 1	50
Union City.....	+ 0	24	Cowitchin Bay .....	+ 1	12
Possession Sound and Washington Sound.			Maple Bay .....	+ 1	18
Muckilteo .....	+ 0	28	Oyster Harbor .....	+ 1	39
Holmes Harbor.....	+ 0	21	Port Graves .....	+ 1	46
Tulalip.....	+ 0	18	Watts Point, Howe Sound .....	+ 1	57
Livingston Bay.....	+ 0	43	Nanoose Harbor .....	+ 2	03
Coupeville .....	+ 0	24	Pender Harbor .....	+ 2	10
Utsalady .....	+ 0	24	Port Augusta.....	+ 2	38
			Baker Passage.....	+ 2	54
			Surge Narrows .....	+ 3	10
			Rendezvous Islands.....	+ 3	14

## TIDAL CONSTANTS.

*Pacific Standard Time—Eight hours slower than Greenwich Time.*

Name of place.	High water.		Name of place.	High water.	
	Correction.			Correction.	
PORT TOWNSEND, WASH.—Continued.			PORT TOWNSEND, WASH.—Continued.		
WASHINGTON AND B. C.—continued.			WASHINGTON AND B. C.—continued.		
<i>Bute Inlet.</i>			<i>Johnstone Strait to Queen Charlotte Sound—Continued.</i>		
Stuart Island.....	h	m	Port Harvey.....	h	m
Waddington Harbor.....	+ 3	27	Sergeant Passage.....	+ 2	12
	+ 4	08	Farewell Harbor.....	+ 2	02
<i>Discovery Passage.</i>			Dusky Cove.....	+ 1	34
Seymour Narrows.....	— 0	13	Sunday Harbor.....	+ 1	27
Gowlland Harbor.....	+ 2	00	Cullen Harbor.....	+ 1	19
<i>Johnstone Strait to Queen Charlotte Sound.</i>			Deep Harbor, Fife Sound.....	+ 1	19
Cameleon Harbor.....	+ 4	23	Tracey Harbor.....	+ 1	38
Knox Bay, Thurlow Island.....	+ 3	55	Cypress Harbor.....	+ 1	20
Beaver Creek.....	+ 3	45	Beaver Cove, Vancouver Island.....	+ 1	49
Forward Harbor.....	+ 3	15	Alert Bay, Cormorant Island.....	+ 1	29
Topaze Harbor.....	+ 3	15	Nimkish River, Vancouver Isl'd ..	+ 1	15
Port Neville.....	+ 2	46	Beaver Harbor, Vancouver Island..	+ 1	20
			Blunden Harbor.....	+ 0	52
			Port Alexander.....	+ 0	51
			Bull Harbor, Hope Island.....	+ 0	55
				+ 0	34

*Sitka Standard Time—Nine hours slower than Greenwich Time.*

SITKA, ALASKA.			SITKA, ALASKA—Continued.		
BRITISH COLUMBIA.			BRITISH COLUMBIA—continued.		
<i>Smith Inlet.</i>			<i>Queen Charlotte Islands.</i>		
Takush Harbor.....	h	m	Port Kuper.....	h	m
	— 0	12	Skidegate Inlet.....	— 0	18
<i>Fitz Hugh Sound.</i>				— 0	11
Schooner Retreat.....	— 0	07	<i>Principe Channel.</i>		
Safety Cove.....	— 0	01	Port Stephens.....	— 0	07
Goldstream Harbor.....	— 0	11	Port Canaveral.....	— 0	02
Namu Harbor.....	+ 0	02			
Welcome Harbor.....	— 0	15	<i>Wright Sound.</i>		
<i>Fisher Channel.</i>			Holmes Bay.....	— 0	12
Port John.....	+ 0	34	Coghlan Anchorage.....	— 0	11
<i>Campbell Island.</i>			<i>Greenville Channel.</i>		
McLaughlin Bay.....	+ 0	15	Lowe Inlet.....	0	00
Kyunmpt Harbor.....	+ 0	10	Klewnugget Inlet.....	+ 0	11
<i>Millbank Sound.</i>			<i>Ogden Channel.</i>		
Port Blakeney.....	— 0	14	Alpha Bay.....	— 0	07
<i>Finlayson Channel.</i>			BRITISH COLUMBIA AND ALASKA.		
Nowish Cove.....	+ 0	06	<i>Dixon entrance.</i>		
Klemtoo Passage.....	+ 0	09	Refuge Bay.....	— 0	12
			Qlawdzeit Anchorage.....	— 0	15
			Metlah Catlah Bay.....	— 0	08

## TIDAL CONSTANTS.

*Sitka Standard Time—Nine hours slower than Greenwich Time.*

Name of place.	High water. Correction.	Name of place.	High water. Correction.
SITKA, ALASKA—Continued.		SITKA, ALASKA—Continued.	
BRITISH COLUMBIA AND ALASKA—continued.		BRITISH COLUMBIA AND ALASKA—continued.	
<i>Dixon entrance—Continued.</i>		<i>Sumner Strait.</i>	
	<i>h m</i>		<i>h m</i>
Port Simpson.....	— 0 12	Port McArthur.....	— 0 05
Somerville Bay, Portland Inlet.....	— 0 11	Shakaan.....	— 0 07
Winter Harbor, Pearse Channel.....	— 0 19	Port Beauliere.....	— 0 02
Nass Bay.....	+ 0 11	Port Protection.....	— 0 03
Observatory Inlet.....	+ 0 15	Red Bay.....	+ 0 01
Halibut Bay.....	+ 0 17	<i>Baranof Island.</i>	
Fords Cove.....	+ 0 20	Cape Ommaney.....	+ 0 05
ALASKA.		<i>Frederick Sound.</i>	
<i>Revillagigedo Channel.</i>		Portage Bay.....	+ 0 04
Cape Fox, Nakat Harbor.....	— 0 20	Thomas Bay.....	+ 0 19
Mary Island.....	— 0 13	Brown Cove.....	+ 0 24
Hassler Harbor.....	— 0 06	Ideal Cove.....	+ 0 35
Gnat Harbor.....	+ 0 12	Eliza Harbor.....	+ 0 12
<i>Behm Canal.</i>		Cleveland Passage.....	+ 0 17
Convenient Cove.....	+ 0 14	Snug Cove, Gambier Bay.....	+ 0 32
Shoalwater Pass.....	+ 0 04	<i>Seymour Canal.</i>	
Burroughs Bay.....	— 0 02	Mole Harbor.....	+ 0 43
Bell Island.....	— 0 16	Windfall Harbor.....	+ 0 23
<i>Tongass Narrows.</i>		<i>Stephens Passage.</i>	
Wards Cove.....	+ 0 04	Holkham Bay.....	+ 0 28
<i>Clarence Strait.</i>		Taku Harbor.....	+ 0 16
Niblack Anchorage.....	— 0 10	Juneau.....	+ 0 36
Tamgas Harbor.....	— 0 13	<i>Lynn Canal.</i>	
Port Chester.....	— 0 08	Funter Bay.....	+ 0 34
Kase-an Bay.....	+ 0 13	Fritz Cove.....	+ 0 41
Union Bay.....	+ 0 12	Barlow Cove.....	+ 0 12
Dewey Anchorage.....	+ 0 03	William Henry Harbor.....	+ 0 35
Steamer Bay.....	+ 0 04	Pyramid Harbor.....	+ 0 10
Port Wrangell.....	+ 0 12	Portage Bay, Chilkoot Inlet.....	+ 0 24
Finger Point.....	+ 0 44	<i>Outer Coast.</i>	
		Yakutat Bay.....	+ 0 47
		George Island.....	+ 0 22

*Tahiti Standard Time—Ten hours slower than Greenwich Time.*

ST. PAUL, KADIAK ISLAND, ALASKA.		ST. PAUL, KADIAK ISLAND, ALASKA—Continued.	
ALASKA.		ALASKA—continued.	
	<i>h m</i>		<i>h m</i>
Icy Bay.....	— 0 31	<i>Cook Inlet—Continued.</i>	
Cape St. Elias.....	— 0 07	Turnagain Bay.....	+ 5 03
<i>Prince William Sound.</i>		Knik River.....	+ 4 40
Port Etches, or Nuchek.....	+ 0 11	<i>Shelikof Strait.</i>	
Port Chalmers.....	+ 0 23	Karluk River.....	+ 0 29
<i>Cook Inlet.</i>		<i>Alaskan Peninsula.</i>	
Port Chatham.....	+ 0 57	Katmai Bay.....	+ 0 34
Fort Kenai, Kaknu River.....	+ 2 30	Semidi Islands, Chowiet Island.....	+ 1 48
Point Possession.....	+ 4 07		

## TIDAL CONSTANTS.

165th Meridian Time—Eleven hours slower than Greenwich Time.

Name of place.	High water.	Name of place.	High water.
	Correction.		Correction.
ST. PAUL, KADIAK ISLAND, ALASKA.		ST. PAUL, KADIAK ISLAND, ALASKA—Continued.	
ALASKA.		ALASKA—continued.	
<i>Alaskan Peninsula.</i>		<i>Bering Sea.</i>	
Unga Strait .....	<sup>h</sup> <sup>m</sup> + 1 59	Goodnews Bay .....	<sup>h</sup> <sup>m</sup> + 4 58
Simeonof Island .....	+ 1 33	Yukon River entrance .....	+ 6 14
<i>Aleutian Islands.</i>		St. Michael, Norton Sound .....	+ 6 44
Iliuliuk Harbor, Unalaska Island ..	+ 3 33	Golovnin Bay, Norton Sound .....	+ 6 38
<i>Pribilof Islands, Bering Sea.</i>		St. Lawrence Island .....	+ 6 17
St. Paul Island, Village Cove .....	+ 4 15	Port Clarence .....	+ 7 14
		<i>Arctic Ocean.</i>	
		Chamisso Island, Kotzebue Sound ..	+ 8 38
		Point Barrow .....	+ 9 44

180th Meridian Time—Twelve hours slower than Greenwich Time.

ST. PAUL, KADIAK ISLAND, ALASKA.		
ALASKA.		
Adakh Island .....	<sup>h</sup> <sup>m</sup> + 2 50	
Kyska Island .....	+ 3 19	
Attu Island .....	+ 3 42	

## Local Mean Time.

ST. PAUL, KADIAK ISLAND, ALASKA.		ST. PAUL, KADIAK ISLAND, ALASKA—Continued.	
ASIA.		ASIA—continued.	
<i>Bering Sea.</i>		<i>Russian Tartary.</i>	
Plover Bay .....	<sup>h</sup> <sup>m</sup> — 6 37	Castries Bay .....	<sup>h</sup> <sup>m</sup> — 2 46
Anadir Bay .....	— 4 11	Dui Road, Sakhalin Island .....	— 2 51
Bering Island .....	+ 2 51	Barracouta Harbor .....	— 3 41
<i>Kamchatka.</i>		Aniwa Bay, Sakhalin Island .....	— 5 31
Petropavlovsk .....	+ 2 22	Olga Bay .....	— 0 10
Cape Lopatka, Kuril Strait .....	+ 2 47	Vladivostok .....	+ 1 40
<i>Okhotsk Sea.</i>		<i>Japan.</i>	
Tigil River entrance .....	— 5 03	<i>Yezo Island.</i>	
Gighiga River entrance .....	— 0 29	Soya Saki .....	+ 9 24
Port Aian .....	— 0 56	Notske Harbor .....	+ 3 43
Amur River entrance .....	— 1 46	Hakodate .....	+ 2 34
North Bay, Sakhalin Island .....	— 2 11		

## TIDAL CONSTANTS.

*Local Mean Time.*

Name of place.	High water.		Name of place.	High water.	
	Correction.			Correction.	
ST. PAUL, KADIAK ISLAND, ALASKA—Continued.			ST. PAUL, KADIAK ISLAND, ALASKA—Continued.		
ASIA—continued.			ASIA—continued.		
Japan—Continued.			Malay Peninsula, East Coast.		
Nippon Island.					
Yamada Harbor .....	<i>h</i>	<i>m</i>	Tringano River.....	<i>h</i>	<i>m</i>
Yokohama, Tokyo Bay.....	+ 3	24	Singapore .....	— 5	26
Osaka Roads .....	+ 4	54		— 3	06
Simonoseki .....	+ 6	25	Java.		
Tsuruga.....	+ 7	25	Batavia .....	— 3	27
Niegate .....	—12	00	Banjoewangi .....	— 0	03
	—10	21	Celebes.		
Sikok Island.			Macassar .....	— 8	48
Nomi Harbor .....	+ 4	55	Manado .....	— 7	29
Uwagima .....	+ 5	55	Borneo.		
Kiusiu Island.			Sarawak City .....	— 8	07
Nagasaki .....	+ 6	10	Sundakan Harbor.....	— 1	28
Yama Gawa .....	+ 6	25	Philippine Islands.		
Kagosima .....	+ 5	45	Samboanga, Mindanao Island.....	— 6	29
Liu-Kiu or Loo-Choo Islands.			Iloilo, Panay Island .....	+10	56
Hancock Bay, Amami On Sima.....	+ 6	25	Manila, Luzon Island .....	+ 9	37
Nafa Kiang, Okinawa Sima .....	+ 5	26	HONOLULU, H. I.		
Korea.			OCEANICA.		
Yung-hing Bay .....	— 8	09	Detached Islands.		
Tsau-liang-hai .....	+ 6	41	Sala-y-Gomez Island.....	+ 0	06
Port Hamilton.....	+ 7	26	Easter Island .....	— 3	13
So Wolmi Island.....	— 8	49	Rapa or Oparo Island.....	— 3	39
Séoul .....	— 3	59	Paumotu or Low Archipelago.		
China.			Gambier or Mangareva Island .....	— 2	00
Yingtze .....	+ 2	56	Bow, Harpe, or Hao Island .....	— 1	09
Pei Ho River entrance .....	+ 2	27	Nairsa or Rangiroa Island .....	+ 0	42
Tientsin, Pei Ho River.....	+ 5	57	Marquesas Islands.		
Kyan-chau Harbor.....	— 8	28	Santa Christina or Taou-ata Islands.....	— 1	19
Shanghai .....	—11	58	Tai o hao Bay, Nouka Hiva Islands.....	+ 0	01
Min River entrance.....	+ 8	57	Society Islands.		
Fu-chau or Foo-chow .....	+10	27	Tahiti or Otaheite Island .....	— 4	13
Kelung Harbor, Formosa Island.....	+ 9	26	Borabora or Bolabola Island .....	— 4	03
Amoy Harbor.....	+10	57	Tubuai or Austral Islands.		
Hongkong Road.....	+ 8	19	Tubuai Island.....	— 0	48
Canton .....	—11	27	Cook or Hervey Islands.		
Yulinkan Bay, Hainan Island .....	+ 8	23	Rarotonga Island.....	+ 1	23
Cochin China.					
Hué River entrance.....	+ 8	28			
Saigon .....	— 8	27			
Siam.					
Chentabun River entrance .....	— 3	26			
Paknam, Menam River.....	+ 4	09			
Bangkok, Menam River.....	+ 6	59			

## TIDAL CONSTANTS.

*Local Mean Time.*

Name of place.	High water. Correction.	Name of place.	High water. Correction.
<b>HONOLULU, H. I.—Continued.</b>		<b>HONOLULU, H. I.—Continued.</b>	
<b>OCEANICA—continued.</b>		<b>OCEANICA—continued.</b>	
<i>Detached Islands.</i>		<i>Gilbert Islands.</i>	
	<i>h m</i>		<i>h m</i>
Caroline Atoll.....	+ 0 12	Apamama or Hopper Island.....	— 0 03
Tonga-rewa or Penrhyn Island.....	+ 1 23	Apaiang or Charlotte Island.....	+ 0 12
Suvarof Island.....	— 1 26		
Christmas Island.....	+ 0 38	<i>Marshall Islands.</i>	
Fanning Island.....	+ 2 13	Ebon Atoll or Boston Island.....	+ 0 12
Palmyra Island.....	+ 1 39	Port Rhin, Mulgrave Island.....	+ 0 27
		Kivajalein Island.....	— 0 32
<i>Hawaiian or Sandwich Islands.</i>		Ailuk Island.....	+ 0 17
Kealahakua, Hawaii Island.....	— 0 07		
Hilo, Hawaii Island.....	— 0 47	<i>Santa Cruz Islands.</i>	
Kahului, Maui Island.....	— 0 02	Vanikoro Island.....	+ 0 18
Molokai Island.....	— 0 07		
Kauai Island.....	— 0 02	<i>Banks Islands.</i>	
<i>Detached Islands.</i>		Patteson, Vanua Lava Island.....	+ 2 08
Midway Island.....	— 0 14		
Howland Island.....	+ 3 26	<i>New Hebrides Islands.</i>	
<i>Phoenix Islands.</i>		Port Sandwich, Mallicolo I's.....	+ 1 28
Enderbury Island.....	+ 0 25	Havannah Harbor, Efate Island.....	+ 2 03
		Aneityum Island.....	+ 1 57
<i>Tokelau or Union Islands.</i>		<i>Loyalty Islands.</i>	
Fakaofu or Bowditch Island.....	+ 1 25	Wreck Bay, Lifou Island.....	+ 1 58
<i>Samoa or Navigator Islands.</i>		<i>New Caledonia.</i>	
Apia, Upolu Island.....	+ 1 55	Nouméa Bay.....	+ 3 53
Pango Pango, Tutuila Island.....	+ 2 25	Port Balad.....	+ 1 43
Manua Island.....	+ 1 25		
<i>Detached Island.</i>		<i>Solomon Islands.</i>	
Uea, Uvea, or Wallis Island.....	+ 2 05	Makira Bay, San Christoval I's.....	+ 2 13
		Vulavu, Isabel Island.....	+ 3 29
<i>Tonga or Friendly Islands.</i>		Gazelle Harbor, Bongainville I's....	+ 7 29
Vavu Island.....	+ 1 45		
Namuka Island.....	+ 3 15	<i>New Britain Island.</i>	
Tongatabu Harbor.....	+ 1 45	Blanche Bay.....	+ 4 30
<i>Kermadec Islands.</i>		<i>New Ireland Island.</i>	
Raoul or Sunday Island.....	+ 1 26	Holz Haven.....	+10 45
		<i>New Hanover Island.</i>	
<i>Fiji Islands.</i>		North Haven.....	+10 25
Vatoo or Turtle Island.....	+ 1 36		
Totoya Island.....	+ 2 01	<i>Caroline Islands.</i>	
Mango Island.....	+ 1 36	Kusaie, or Ualan Island.....	+ 1 28
Ngaloa Bay, Kandavu Island.....	+ 2 01	Kiti Harbor, Ponapi Island.....	— 0 31
Suva Harbor, Viti Levu Island.....	+ 1 56	Tomil Bay, Yap or Uap Island.....	+ 2 47
Savu Savu Bay, Vanua Levu Islands	+ 1 26		
<i>Detached Island.</i>		<i>Mariana or Ladrone Islands.</i>	
Rotumah Island.....	+ 1 41	Guam, or Guajan Island.....	+ 2 21
		Saipan Island.....	+ 2 16

## TIDAL CONSTANTS.

*Local Mean Time.*

Name of place.	High water.	Name of place.	High water.
	Correction.		Correction.
HONOLULU, H. I.—Continued.		PANAMA, COLOMBIA.	
OCEANICA—continued.		SOUTH AMERICA.	
<i>Bonin or Arzobispo Islands.</i>		<i>Tierra del Fuego, Southwest Coast.</i>	
	<i>h m</i>		<i>h m</i>
Newport, Hillsborough Island .....	+ 2 01	Cape Horn .....	—11 47
Port Lloyd, Peel Island .....	+ 1 41	Cape San Diego .....	—10 57
<i>Papua or New Guinea.</i>		Nassau Bay .....	—11 27
		New-Year Sound .....	—12 06
Has, Dampier Strait .....	—11 23	Noir Island .....	+11 54
Port Moresby .....	+ 4 40	Week Island .....	+11 24
<i>Australia.</i>		<i>Magellan Strait.</i>	
Port Darwin .....	—11 07	Cape Virgin .....	+ 5 29
Kimberley, Carpentaria Gulf .....	—11 24	Direction Hill .....	+ 5 52
Cape York, Torres Strait .....	+ 9 06	First Narrows .....	+ 5 59
Cooktown .....	+ 3 31	Second Narrows .....	+ 6 59
Townsville .....	+ 4 30	Elizabeth Island .....	+ 7 39
Bowen, Port Denison .....	+ 5 50	Sandy Point Road .....	+ 8 19
Mackay, Pioneer River .....	+ 6 40	Port Famine .....	+ 9 04
Rockhampton, Fitzroy River .....	+ 7 30	Port Gallant .....	+ 9 34
Bundaberg, Burnett River .....	+ 5 00	Smyth Harbor .....	+10 14
Brisbane .....	+ 6 30	Port Mercy .....	+10 19
Southhead, Clarence River .....	+ 4 00	Cape Pillar .....	+10 24
Crowdy Head .....	+ 4 45	<i>Patagonia.</i>	
Newcastle, Port Hunter .....	+ 4 20	Evangelistas Island .....	+10 19
Sydney, Port Jackson .....	+ 4 10	Guia Narrows .....	+11 34
Gabo Island .....	+ 4 20	Port Henry, Gulf of Trinidad .....	+ 9 54
Corner Inlet .....	— 4 15	English Narrows .....	+10 24
Melbourne, Port Phillip .....	— 1 39	Port Barbara, Penas Gulf .....	+ 9 39
Adelaide .....	+ 0 56	Port Otway, Penas Gulf .....	+ 9 34
<i>Tasmania.</i>		San Andres Bay .....	+ 9 29
Port Dalrymple .....	+ 6 40	Anna Pink Bay, Cape Taytao .....	+ 9 24
Hobart .....	+ 3 45	Vallenar Road .....	+ 9 14
<i>New Zealand.</i>		Port Low .....	+ 9 19
Port Pegasus, Stewart Island .....	+ 7 18	<i>Chiloe Archipelago.</i>	
Bluff Harbor, South Island .....	+ 9 13	Huafu Island .....	+ 9 09
Dusky Bay, South Island .....	+ 6 43	Cucao Bay .....	+ 9 04
Hokitika, South Island .....	+ 5 42	Castro .....	+ 9 34
Greymouth, South Island .....	+ 5 42	Chacao Narrows .....	+10 14
Westport Buller River, South Island .....	+ 5 47	Port San Carlos .....	+ 8 59
Nelson, South Island .....	+ 5 17	<i>Chile.</i>	
Lyttleton, South Island .....	+12 12	Maulin River .....	+ 8 54
Timaru, South Island .....	+11 22	Port Valdivia .....	+ 8 34
Oamaru, South Island .....	+10 52	Mocha Island .....	+ 8 06
Dunedin, Otago Harbor, South Island .....	+12 22	Aranco Bay .....	+ 7 44
Wellington, North Island .....	—11 58	Maule River .....	+ 7 09
New Plymouth, North Island .....	— 4 57	Toro Point .....	+ 6 44
Kaipara Harbor Entrance, North Island .....	+ 6 22	Valparaiso .....	+ 6 31
Port Russell, North Island .....	+ 2 42	Juan Fernandez Island .....	+ 6 40
Auckland Harbor, North Island .....	+ 2 32	Pichidangu Bay .....	+ 6 27
Tauranga Harbor, North Island .....	+ 2 36	Oscuro Cove .....	+ 6 24
East Cape, North Island .....	+ 4 21	Port Tongoy .....	+ 6 20
Napier, North Island .....	— 9 09	Coquimbo Bay .....	+ 6 19
		Port Hnasco .....	+ 6 14
		Copiapo .....	+ 6 10
		Port Flamenco .....	+ 6 07

## TIDAL CONSTANTS.

*Local Mean Time.*

Name of place.	High water. Correction.	Name of place.	High water. Correction.
PANAMA, COLOMBIA—Continued.		PANAMA, COLOMBIA—Continued.	
SOUTH AMERICA—continued.		SOUTH AMERICA—continued.	
<i>Chile</i> —Continued.		<i>Colombia</i> —Continued.	
	<i>h m</i>		<i>h m</i>
Grand Point.....	+ 6 02	Chepo River, Panama Gulf.....	+ 0 05
Moreno Point.....	+ 5 56	Taboga, Panama Gulf.....	0 00
Iquique Road.....	+ 5 44	Chamé Bay, Panama Gulf.....	— 0 02
		Cape Mala, Panama Gulf.....	— 0 04
<i>Peru.</i>		Bahia Honda.....	— 0 05
		Parida Island.....	— 0 07
Arica Road.....	+ 5 15		
Ilo Road.....	+ 4 54	NORTH AMERICA.	
Islay Road.....	+ 4 38	<i>Costa Rica.</i>	
Port San Juan.....	+ 3 46		
Pisco Bay.....	+ 3 16	El Rincon Harbor.....	— 0 08
Callao Bay.....	+ 2 47	Uvita Bay.....	— 0 09
Huacho Bay.....	+ 2 29	Port Herradura.....	— 0 11
Guarmey Bay.....	+ 2 08	Port Culebra.....	— 0 14
Ferrol Bay.....	+ 1 50	Port Elena.....	— 0 15
Port Malabrigo.....	+ 1 19		
Eten Point.....	+ 1 04	<i>Nicaragua.</i>	
Paita.....	+ 0 20		
		Port San Juan del Sur.....	— 0 16
<i>Ecuador.</i>		Corinto Harbor.....	— 0 19
Santa Clara Island.....	+ 1 00	<i>Honduras.</i>	
Guayaquil.....	+ 4 00		
Santa Elena Bay.....	0 00	Amapala.....	+ 0 01
Port Manta.....	+ 0 10		
Cape Pasado.....	+ 0 15	<i>San Salvador.</i>	
Atacames Bay.....	+ 0 25		
		Port la Union.....	— 0 09
<i>Gallapagos Islands.</i>		Libertad.....	— 0 23
		Acajutla Bay.....	— 0 24
Charles Island.....	— 0 49		
Albemarle Island.....	— 0 58	<i>Guatemala.</i>	
Chatham Island.....	— 0 39		
Indefatigable Island.....	— 0 59	San Jose Road.....	— 0 04
James Island.....	— 0 14		
		<i>Mexico, West Coast.</i>	
<i>Colombia.</i>			
		Salina Cruz Bay.....	+ 1 31
Tumaco Road.....	+ 0 35	Port Sacrificios.....	+ 1 54
Buenaventura.....	+ 3 00	Maldonado.....	+ 2 51
Negrillas Rocks.....	+ 1 00	Acapulco.....	+ 3 13
Cabita Bay.....	+ 0 40	Port Sihuatanejo.....	+ 3 49
Cupica Bay.....	+ 0 30	Manzanillo.....	+ 4 50
Pinas Bay, Panama Gulf.....	+ 0 15	Chamela or Perula Bay.....	+ 5 10
Rey Island, Panama Gulf.....	0 00		



TABLE OF SUNRISE AND SUNSET FOR  
SAN FRANCISCO, CAL.

TABLE OF SUNRISE AND SUNSET FOR SAN FRANCISCO, CAL.

*Pacific Standard Time—Eight hours slower than Greenwich Time.*

1898.

Day of month.	January.		February.		March.		April.		May.		June.	
	Sun- rise.	Sun- set.	Sun- rise.	Sun- set.	Sun- rise.	Sun- set.	Sun- rise.	Sun- set.	Sun- rise.	Sun- set.	Sun- rise.	Sun- set.
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
1	7 25	5 03	7 14	5 34	6 40	6 04	5 53	6 34	5 13	7 01	4 48	7 27
2	7 25	5 03	7 13	5 35	6 38	6 05	5 52	6 34	5 12	7 02	4 48	7 27
3	7 25	5 04	7 12	5 36	6 37	6 06	5 50	6 35	5 10	7 03	4 47	7 28
4	7 26	5 05	7 11	5 37	6 36	6 07	5 49	6 36	5 09	7 04	4 47	7 28
5	7 26	5 06	7 10	5 38	6 34	6 08	5 47	6 37	5 08	7 04	4 47	7 29
6	7 26	5 06	7 09	5 39	6 32	6 09	5 46	6 38	5 07	7 05	4 47	7 29
7	7 26	5 07	7 07	5 41	6 31	6 10	5 45	6 39	5 06	7 06	4 47	7 30
8	7 26	5 08	7 06	5 42	6 30	6 11	5 43	6 39	5 05	7 07	4 47	7 30
9	7 26	5 09	7 05	5 43	6 29	6 12	5 42	6 40	5 04	7 08	4 47	7 31
10	7 25	5 10	7 04	5 44	6 27	6 13	5 40	6 41	5 03	7 09	4 47	7 31
11	7 25	5 11	7 03	5 45	6 25	6 14	5 39	6 42	5 02	7 10	4 47	7 32
12	7 25	5 12	7 02	5 46	6 24	6 15	5 38	6 43	5 01	7 10	4 47	7 32
13	7 24	5 13	7 01	5 47	6 22	6 16	5 36	6 44	5 00	7 11	4 47	7 33
14	7 24	5 14	7 00	5 48	6 21	6 17	5 34	6 45	4 59	7 12	4 47	7 33
15	7 24	5 15	6 59	5 49	6 20	6 18	5 33	6 46	4 59	7 13	4 47	7 33
16	7 24	5 16	6 57	5 50	6 18	6 19	5 31	6 46	4 58	7 14	4 47	7 34
17	7 23	5 17	6 56	5 51	6 17	6 19	5 30	6 47	4 57	7 15	4 47	7 34
18	7 23	5 18	6 55	5 52	6 16	6 20	5 29	6 48	4 56	7 16	4 47	7 34
19	7 23	5 19	6 54	5 53	6 14	6 21	5 27	6 49	4 55	7 17	4 47	7 35
20	7 22	5 20	6 53	5 54	6 13	6 22	5 26	6 50	4 54	7 18	4 47	7 35
21	7 22	5 21	6 52	5 55	6 11	6 23	5 25	6 51	4 53	7 18	4 48	7 35
22	7 21	5 22	6 50	5 56	6 09	6 24	5 23	6 52	4 52	7 19	4 48	7 35
23	7 20	5 23	6 49	5 57	6 08	6 24	5 22	6 53	4 51	7 20	4 48	7 35
24	7 19	5 25	6 47	5 58	6 06	6 25	5 21	6 54	4 51	7 21	4 48	7 35
25	7 19	5 26	6 46	6 00	6 04	6 26	5 20	6 55	4 50	7 22	4 49	7 35
26	7 18	5 27	6 45	6 01	6 03	6 27	5 18	6 56	4 50	7 23	4 49	7 35
27	7 18	5 28	6 43	6 02	6 01	6 28	5 17	6 57	4 49	7 23	4 49	7 35
28	7 17	5 29	6 42	6 03	6 00	6 29	5 16	6 58	4 49	7 24	4 50	7 35
29	7 16	5 30	. .	. .	5 58	6 30	5 15	6 59	4 48	7 25	4 50	7 35
30	7 15	5 31	. .	. .	5 56	6 31	5 14	7 00	4 48	7 26	4 50	7 35
31	7 14	5 33	. .	. .	5 55	6 33	. .	. .	4 48	7 26	. .	. .

The above table gives the *Pacific Standard Time* at which the upper limb or edge of the sun will be at the sensible horizon (corrected for refraction) of San Francisco at rising or setting.

*Mean Time* is that shown by a perfectly regulated timekeeper, as a clock or chronometer.

*Apparent Time* is that shown by the sun.

*Apparent Time* differs from *Mean Time* at most seasons of the year (owing to the unequal motion of the earth in its orbit and the inclination of its axis), and this variation is called the *Equation of Time*. When the equation is 0 the sun and clock are even.

If you reverse the sign of the Equation of Time as shown in the Tables of Equation, and then apply this equation to the sun's rising or setting on any given day, you will have the Apparent Time of rising or setting.

To find the *Pacific Standard Time* of rising or setting at any point East or West of San Francisco, add the longitude from San Francisco (expressed in time) when the place is West, and subtract it when East, from the times in the table.

To find the *Local Mean Time*, subtract 9<sup>m</sup> 38<sup>s</sup> from the numbers in the table.

TABLE OF SUNRISE AND SUNSET FOR SAN FRANCISCO, CAL.

*Pacific Standard Time—Eight hours slower than Greenwich Time.*

1898.

Day of month.	July.		August.		September.		October.		November.		December.	
	Sun-rise.	Sun-set.	Sun-rise.	Sun-set.	Sun-rise.	Sun-set.	Sun-rise.	Sun-set.	Sun-rise.	Sun-set.	Sun-rise.	Sun-set.
1	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
2	4 51	7 35	5 13	7 18	5 40	6 39	6 06	5 53	6 36	5 11	7 08	4 50
3	4 51	7 35	5 14	7 17	5 41	6 37	6 06	5 52	6 37	5 09	7 09	4 50
4	4 52	7 35	5 15	7 16	5 41	6 36	6 07	5 50	6 39	5 08	7 10	4 50
5	4 52	7 35	5 16	7 15	5 42	6 35	6 08	5 48	6 40	5 07	7 11	4 50
6	4 53	7 35	5 17	7 14	5 43	6 33	6 09	5 46	6 41	5 06	7 11	4 50
7	4 53	7 35	5 18	7 13	5 45	6 32	6 10	5 44	6 43	5 05	7 12	4 50
8	4 54	7 35	5 18	7 12	5 45	6 31	6 11	5 43	6 44	5 04	7 13	4 50
9	4 54	7 34	5 19	7 11	5 46	6 29	6 12	5 41	6 45	5 03	7 14	4 50
10	4 55	7 34	5 20	7 10	5 46	6 27	6 13	5 40	6 46	5 02	7 14	4 51
11	4 55	7 34	5 21	7 09	5 47	6 25	6 14	5 39	6 47	5 01	7 15	4 51
12	4 56	7 34	5 22	7 07	5 48	6 24	6 15	5 38	6 48	5 00	7 15	4 51
13	4 56	7 33	5 23	7 06	5 49	6 22	6 16	5 37	6 49	5 00	7 16	4 51
14	4 57	7 33	5 24	7 05	5 50	6 20	6 17	5 35	6 50	4 59	7 17	4 52
15	4 58	7 32	5 25	7 04	5 50	6 19	6 18	5 34	6 51	4 58	7 18	4 52
16	4 59	7 32	5 26	7 03	5 51	6 18	6 19	5 32	6 52	4 58	7 19	4 52
17	5 00	7 31	5 26	7 01	5 52	6 16	6 20	5 30	6 53	4 57	7 19	4 53
18	5 01	7 30	5 27	7 00	5 53	6 14	6 21	5 28	6 54	4 57	7 20	4 53
19	5 01	7 30	5 28	6 58	5 54	6 12	6 22	5 27	6 55	4 56	7 20	4 53
20	5 02	7 29	5 29	6 56	5 55	6 10	6 23	5 26	6 56	4 56	7 21	4 54
21	5 02	7 29	5 30	6 55	5 56	6 08	6 24	5 25	6 56	4 55	7 21	4 54
22	5 03	7 28	5 31	6 54	5 57	6 07	6 25	5 24	6 57	4 55	7 22	4 55
23	5 04	7 27	5 32	6 53	5 58	6 06	6 26	5 23	6 58	4 54	7 22	4 55
24	5 05	7 27	5 32	6 51	5 59	6 05	6 26	5 20	6 59	4 54	7 22	4 56
25	5 06	7 26	5 33	6 49	6 00	6 03	6 27	5 19	7 00	4 53	7 23	4 56
26	5 07	7 25	5 34	6 48	6 00	6 02	6 28	5 18	7 02	4 53	7 23	4 57
27	5 08	7 24	5 35	6 47	6 01	6 00	6 29	5 17	7 03	4 52	7 23	4 57
28	5 09	7 23	5 36	6 45	6 02	5 59	6 30	5 16	7 04	4 52	7 24	4 58
29	5 09	7 22	5 37	6 44	6 03	5 58	6 31	5 15	7 05	4 51	7 24	4 58
30	5 10	7 21	5 38	6 43	6 04	5 57	6 32	5 14	7 06	4 51	7 24	4 59
31	5 11	7 20	5 38	6 41	6 04	5 55	6 34	5 13	7 07	4 50	7 25	5 00
	5 12	7 19	5 39	6 40	.	.	6 35	5 12	.	.	7 25	5 01

The above table gives the *Pacific Standard Time* at which the upper limb or edge of the sun will be at the sensible horizon (corrected for refraction) at rising or setting.

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To find the *Local Mean Time* subtract 9<sup>m</sup> 38<sup>s</sup> from the numbers in the table.





